Comparision of calculated and measured paleo-sea level using different lower mantle viscosity values and PaleoMIST 1.0

As a supplement to "*A new global ice sheet reconstruction for the past 80 000 years*" by Evan J. Gowan, Xu Zhang, Sara Khosravi, Alessio Rovere, Paolo Stocchi, Anna L. C. Hughes, Richard Gyllencreutz, Jan Mangerud, John-Inge Svendsen & Gerrit Lohmann

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Contents

1 Purpose of this document

In this report there is a detailed summary, including plots, of a worldwide compilation of paleo-sea level data, and six ice sheet-Earth models. In this particular report, we compare the standard version of PaleoMIST 1.0 (with 2500 year time steps and using a lower mantle viscosity of 4×10^{22} Pa s), with five other Earth models with viscosity values ranging between 10^{21} and 10^{23}. When developing PaleoMIST 1.0, a variety of lower mantle viscosity values were tested, and it was found that a value approaching 10^{23} Pa s provided the best trade-off between increasing the amount of ice in the center of the Laurentide Ice Sheet and fitting the sea level data. This ended up being true for the Eurasian ice sheets as well. PaleoMIST 1.0 was tuned to an Earth model with a viscosity of 4×10^{22} Pa s, but the comparison shown in this document demonstrate that a slightly higher value of 10^{23} Pa s provides an even better fit.

2 Summary of ice and Earth models

In order to make the figures compact, I have made shorthand codes for the ice and Earth models. I calculate each ice sheet separately, and the numbers refer to the "run number", which is a sequential number that I used to distinguish git commits (see `https://github.com/evangowan/icesheet`). The ice model numbering scheme is as follows:

"North America"_"Europe"_"Antarctica"_"Patagonia"

For PaleoMIST 1.0, the minimal MIS 3 configuration reconstruction is 72_73_74_75, while the maximal configuration is 82_83_85_85

For the Earth models, I created a shorthand scheme during my PHD, which I have continued to use. A full explanation can be found on the github page:

`https://github.com/evangowan/icesheet/blob/prelim/global/earth_model_format_codes.txt`

The full description of each model compared in this document is in this section.

2.1 Ice models

72_73_74_75 - PaleoMIST 1.0 - reduced MIS 3 Laurentide Ice Sheet scenario, with Hudson Bay fully deglaciated

2.2 Earth models

ehgA - 120 km thick lithopshere, 4×10^{20} Pa s upper mantle, 1×10^{21} Pa s lower mantle

ehgC - 120 km thick lithopshere, 4×10^{20} Pa s upper mantle, 1.58×10^{21} Pa s lower mantle

ehgG - 120 km thick lithopshere, 4×10^{20} Pa s upper mantle, 4×10^{21} Pa s lower mantle

ehgk - 120 km thick lithopshere, 4×10^{20} Pa s upper mantle, 1×10^{22} Pa s lower mantle

ehgK - 120 km thick lithopshere, 4×10^{20} Pa s upper mantle, 1×10^{23} Pa s lower mantle

ehgr - 120 km thick lithopshere, 4×10^{20} Pa s upper mantle, 4×10^{22} Pa s lower mantle

3 Paleo-sea level compilations

This is a list of paleo-sea level compilations, which served as the basis for this report. We acknowledge the hard work of the people compiling the data, as well as acknowledging those who collected the original data.

3.1 North America

- Canada and Greenland - A.S. Dyke and T.S. James (unpublished)
- Eastern Canada - Vacchi et al. (2018)
- Hudson Bay - Simon et al. (2016)
- Hudson Bay and northern mainland Canada - Gowan et al. (2016)

I have made some changes and corrections from the compilations above.

At Churchill, there is a site, denoted with the radiocarbon date S-738, which was originally assigned to be a marine limiting indicator. It was described in Morlan et al. (2000) as "shells enclosed in gravel in a quartzite ridge". It was originally interpreted as being a sea level indicator, with sea level at around 35 m. Using IMCalc (Lorscheid and Rovere, 2019), and a tidal amplitude of 1.6 m based on the tide gauge at Churchill (Ray, 2016), assuming the landform represents a beach ridge, and including a 20% uncertainty on the original 35 m elevation (to account for the lack of information on elevation measurement), the sea level indicator is 32.8 ± 7 m.

There were many data that refered just to compilations rather than the original sources. I have tried to track down the original sources as much as possible, but in some cases it was not possible, as they were neither listed in the Vacchi compilation nor the Dyke and James compilation.

The compilation of sea level indicators in the eastern United States was done by Engelhart and Horton (2012). Thanks to Simon Engelhart for sending me a copy of the dataset with the reservoir corrections used for marine organisms.

The MIS 3-5 data from the east coast of the United States was compiled by Pico et al. (2017).

3.2 Europe

The Baltic Sea sea level indicators are from an unpublished compilation provided by Holger Steffen:

Rosentau et al. (in prep.) A Holocene relative sea-level database for the Baltic Sea.

When the paper becomes available, I will add the appropriate references.

Scandinavia sea level indicators are from and unpublished compilation by Jan Mangerud, Kristian Vasskog and Øystein Lohne. Some parts of the compilation can be found in:

- Svalbard - Bondevik et al. (1995)

- Northern Europe - Forman et al. (2004)
- Norway - Lohne et al. (2007); Romundset et al. (2010, 2011, 2015, 2018); Vasskog et al. (2019)

The compilation of sea level indicators for Rotterdam in the Netherlands is from Hijma and Cohen (2019).

3.3 Eurasian Arctic

The sea level indicators for northern Norway and Svalbard are from and unpublished compilation by Jan Mangerud, Kristian Vasskog and Øystein Lohne (see details in Section 3.2).

The compilation of sea level indicators for northern Russia comes from Baranskaya et al. (2018a). Thank you to Alisa V. Baranskaya for sending the references (including translations from Russian) that were missing from the published compilation.

3.4 Southeastern Asia

The sea level indicators from southeastern Asia were compiled by Mann et al. (2019).

3.5 Tropical Corals

Corals from tropical regions were compiled by Hibbert et al. (2016). In this report, we have taken indicators for Huon Peninsula and French Polynesia from this database.

4 Summary of results

This is a summary of the results of the modelling. There are a total of six models with which are compared. In addition, these tables give how many sea level indicators, number of marine limiting, number of terrestrial limiting, and number of sea level index points.

The sea level is calculated at the location of each data point. To evaluate how well the calculated curve fits the data point, a score is assigned. This metric was originally used by Gowan et al. (2016). The score is the discrepancy, in number of meters, the calculated sea level falls outside of the constraint plus the error bars. A score is zero if the calculated sea level is consistent with the data point. As an example, if the calculated sea level curve is below a terrestrial limiting point, it is given a score of zero. The sum of the scores for each location for each model are shown in the tables. A warning about the scores is that a lower score does not necessarily mean a better fit, as it will depend on the age distribution of the indicators, and the number of indicators of a specific kind. For example, if there are a lot of marine limiting data points, a calculated curve that is over a hundred meters above those indicators may provide a good score, but it is not necessarily a good fit. As a result, it is a good idea to also look at the plotted curves for visual inspection.

4.1 Australia

Table 1: Number of data points and model scores for Northeastern Australia

Location	number data	marine limiting	terrestrial limiting	index point	72_73_74_75 ehgA	72_73_74_75 ehgC	72_73_74_75 ehgG	72_73_74_75 ehgk	72_73_74_75 ehgr	72_73_74_75 ehgK
Total	556	54	0	502	4731	4687	4482	4134	3660	3550
Cairns	253	11	0	242	4057	4014	3807	3460	3010	2906
Mackay	303	43	0	260	674	673	675	674	650	644

Table 2: Number of data points and model scores for Northwestern Australia

Location	number data	marine limiting	terrestrial limiting	index point	72_73_74_75 ehgA	72_73_74_75 ehgC	72_73_74_75 ehgG	72_73_74_75 ehgk	72_73_74_75 ehgr	72_73_74_75 ehgK
Total	75	75	0	0	0	0	1	6	27	34
Bonaparte Gulf	75	75	0	0	0	0	1	6	27	34

4.2 Caribbean

Table 3: Number of data points and model scores for Lesser Antilles

Location	number data	marine limiting	terrestrial limiting	index point	72_73_74_75 ehgA	72_73_74_75 ehgC	72_73_74_75 ehgG	72_73_74_75 ehgk	72_73_74_75 ehgr	72_73_74_75 ehgK
Total	108	53	0	55	301	291	266	241	304	363
Barbados	108	53	0	55	301	291	266	241	304	363

4.3 Eurasian Arctic

Table 4: Number of data points and model scores for Franz Josef Land

Location	number data	marine limiting	terrestrial limiting	index point	72_73_74_75 ehgA	72_73_74_75 ehgC	72_73_74_75 ehgG	72_73_74_75 ehgk	72_73_74_75 ehgr	72_73_74_75 ehgK
Total	171	22	0	149	915	840	1320	1648	1759	1712
Zemlya Georga	44	4	0	40	193	176	359	468	502	488
Zemlya Zichy	4	3	0	1	73	63	47	39	36	36
Proliv Markama	123	15	0	108	649	601	914	1141	1221	1188

Table 5: Number of data points and model scores for Kara Sea - Novaya Zemlya

Location	number data	marine limiting	terrestrial limiting	index point	72_73_74_75 ehgA	72_73_74_75 ehgC	72_73_74_75 ehgG	72_73_74_75 ehgk	72_73_74_75 ehgr	72_73_74_75 ehgK
Total	90	8	19	63	516	426	328	352	367	370
Pechora Sea	5	4	1	0	69	67	71	88	101	105
Yuzhny Island	4	1	3	0	57	40	0	0	0	0
Severny Island West	19	1	0	18	28	4	6	19	24	22
Severny Island North	36	0	0	36	145	98	25	14	10	10
Vaygach Island	3	0	0	3	0	0	0	0	0	0
Baydaratskaya Bay	2	0	2	0	0	0	0	0	0	0
Gulf of Ob	11	0	9	2	0	0	0	0	0	0
Khalmyer Bay	5	0	1	4	217	217	226	231	232	233
Kara Sea shelf	2	2	0	0	0	0	0	0	0	0
Ostrov Sibiryakova	3	0	3	0	0	0	0	0	0	0

Table 6: Number of data points and model scores for Southern Barents Sea

Location	number data	marine limiting	terrestrial limiting	index point	72_73_74_75 ehgA	72_73_74_75 ehgC	72_73_74_75 ehgG	72_73_74_75 ehgk	72_73_74_75 ehgr	72_73_74_75 ehgK
Total	54	17	3	34	803	1091	1193	804	484	398
Rolfsoya	5	0	1	4	122	166	182	131	81	65
Norkinn	6	1	1	4	143	195	212	155	101	84
Pechengsky	17	7	0	10	128	206	277	216	146	124
Murmansk	21	8	1	12	248	348	397	264	143	111
Voronya River	5	1	0	4	162	176	125	38	13	14

Table 7: Number of data points and model scores for Svalbard

Location	number data	marine limiting	terrestrial limiting	index point	72_73_74_75 ehgA	72_73_74_75 ehgC	72_73_74_75 ehgG	72_73_74_75 ehgk	72_73_74_75 ehgr	72_73_74_75 ehgK
Total	179	26	10	143	1934	1874	2011	2036	1912	1853
Bockfjorden	11	8	0	3	215	155	111	128	176	195
Broggerhalvoya	11	2	1	8	297	256	259	310	384	410
Ytterdalen	11	3	2	6	188	128	79	102	149	168
Sorkapp Land	13	3	2	8	48	57	59	70	107	128
Agardbukta	9	2	0	7	91	67	33	20	14	16
Southern Edgeoya	17	1	1	15	208	241	271	244	192	171
Diskobukta	20	4	1	15	181	166	184	172	122	101
Humla	28	1	1	26	279	378	487	468	374	332
Kapp Ziehen	25	2	2	21	188	214	246	227	154	124
Svartknausflya	20	0	0	20	117	80	109	112	77	58
Kongsoya	14	0	0	14	122	132	173	183	163	150

Table 8: Number of data points and model scores for Western Siberia

Location	number data	marine limiting	terrestrial limiting	index point	72_73_74_75 ehgA	72_73_74_75 ehgC	72_73_74_75 ehgG	72_73_74_75 ehgk	72_73_74_75 ehgr	72_73_74_75 ehgK
Total	125	90	23	12	879	901	970	913	782	755
Severnaya Zemlya	16	5	11	0	352	356	357	336	315	312
West Laptev Sea	10	7	1	2	96	100	103	93	83	81
Olenyok Gulf	29	18	11	0	32	34	44	43	32	29
Lena Delta	60	60	0	0	329	340	398	382	302	286
New Siberian Islands	8	0	0	8	3	2	3	7	11	11
Zhokhov Island	2	0	0	2	67	69	65	52	39	36

Table 9: Number of data points and model scores for White Sea

Location	number data	marine limiting	terrestrial limiting	index point	72_73_74_75 ehgA	72_73_74_75 ehgC	72_73_74_75 ehgG	72_73_74_75 ehgk	72_73_74_75 ehgr	72_73_74_75 ehgK
Total	177	16	41	120	2993	3120	2676	1631	951	803
Kandalaksha	8	1	0	7	177	217	237	156	94	78
Lesozavodskiy	13	5	0	8	477	520	455	289	161	129
Rugozerskiy Peninsula	15	1	8	6	132	168	165	78	21	11
Chupa Bay	15	0	3	12	958	995	816	496	264	206
Umba	11	2	0	9	520	553	486	311	180	147
Engozero	8	0	1	7	419	449	373	210	86	56
Belomorsk	8	0	7	1	179	179	84	11	0	0
Eastern Kola Peninsula	5	0	5	0	0	0	1	0	0	0
Onega Peninsula	9	3	2	4	24	6	0	3	14	19
Dvina Gulf	82	4	12	66	107	33	59	77	131	157
Kholmogorsky	3	0	3	0	0	0	0	0	0	0

4.4 Europe

Table 10: Number of data points and model scores for Baltic Sea

Location	number data	marine limiting	terrestrial limiting	index point	72_73_74_75 ehgA	72_73_74_75 ehgC	72_73_74_75 ehgG	72_73_74_75 ehgk	72_73_74_75 ehgr	72_73_74_75 ehgK
Total	467	64	169	234	9557	11821	12528	9825	7449	6893
Norrbotten	16	0	0	16	1232	1407	1405	1122	878	821
Angermanland	14	0	0	14	433	568	638	459	309	281
Gastrikland	16	0	0	16	596	754	843	683	532	500
Stockholm	16	0	0	16	594	734	796	629	473	439
Aland	3	0	0	3	63	107	139	119	97	92
Oulu	2	0	0	2	198	225	221	179	142	134
Ostrobothnia	5	0	0	5	326	399	415	334	261	245
Turku	35	0	0	35	1282	1699	1946	1645	1358	1289
Gulf Of Finland	121	11	45	65	2801	3806	4201	3175	2161	1897
Gulf Of Riga	39	11	27	1	813	1035	1055	738	453	382
Kaliningrad	110	29	81	0	510	587	579	345	198	170
Bornholm	90	13	16	61	709	500	290	397	587	643

Table 11: Number of data points and model scores for Danish straits - Kattegat - Skagerrak

Location	number data	marine limiting	terrestrial limiting	index point	72_73_74_75 ehgA	72_73_74_75 ehgC	72_73_74_75 ehgG	72_73_74_75 ehgk	72_73_74_75 ehgr	72_73_74_75 ehgK
Total	655	339	198	118	2427	1845	1809	1930	2317	2465
Mecklenburg	177	66	52	59	716	491	412	826	1240	1347
Kiel	48	16	31	1	86	50	48	71	99	110
Great Belt	155	85	56	14	438	225	152	164	303	363
Copenhagen	78	28	49	1	199	152	150	75	72	77
Kattegat	33	32	0	1	29	3	5	5	5	6
Northern Jylland	56	51	1	4	48	45	74	49	20	13
Limfjord	56	52	4	0	218	75	64	47	44	46
Halland	13	0	0	13	469	555	558	405	265	234
Halden	9	4	2	3	17	4	20	22	31	32
Ski	12	5	2	5	71	85	101	69	75	83
Kragerod Porsgrunn	18	0	1	17	136	160	225	197	163	154

Table 12: Number of data points and model scores for North Sea

Location	number data	marine limiting	terrestrial limiting	index point	72_73_74_75 ehgA	72_73_74_75 ehgC	72_73_74_75 ehgG	72_73_74_75 ehgk	72_73_74_75 ehgr	72_73_74_75 ehgK
Total	102	0	52	50	330	319	287	308	302	300
Rotterdam	102	0	52	50	330	319	287	308	302	300

Table 13: Number of data points and model scores for Western Norway

Location	number data	marine limiting	terrestrial limiting	index point	72_73_74_75 ehgA	72_73_74_75 ehgC	72_73_74_75 ehgG	72_73_74_75 ehgk	72_73_74_75 ehgr	72_73_74_75 ehgK
Total	103	9	8	86	1852	2061	1882	1227	969	953
Stavanger	17	8	3	6	220	210	160	72	38	36
Sotra	41	1	2	38	317	362	306	213	309	346
Torvikbygd	8	0	1	7	86	75	88	106	119	121
Sula	9	0	2	7	279	316	301	204	117	93
Bjugn	17	0	0	17	605	690	644	410	237	217
Frosta	11	0	0	11	345	408	383	222	149	140

4.5 French Polynesia

Table 14: Number of data points and model scores for French Polynesia

Location	number data	marine limiting	terrestrial limiting	index point	72_73_74_75 ehgA	72_73_74_75 ehgC	72_73_74_75 ehgG	72_73_74_75 ehgk	72_73_74_75 ehgr	72_73_74_75 ehgK
Total	200	200	0	0	100	100	101	107	115	115
Mururoa	14	14	0	0	73	73	73	75	78	78
Tahiti	186	186	0	0	27	27	28	32	37	37

4.6 MIS 3 - MIS 4

Table 15: Number of data points and model scores for Eastern United States (MIS3 - MIS4)

Location	number data	marine limiting	terrestrial limiting	index point	72_73_74_75 ehgA	72_73_74_75 ehgC	72_73_74_75 ehgG	72_73_74_75 ehgk	72_73_74_75 ehgr	72_73_74_75 ehgK
Total	27	8	15	4	198	175	136	110	96	91
US Mid Atlantic	27	8	15	4	198	175	136	110	96	91

Table 16: Number of data points and model scores for French Polynesia (MIS3 - MIS4)

Location	number data	marine limiting	terrestrial limiting	index point	72_73_74_75 ehgA	72_73_74_75 ehgC	72_73_74_75 ehgG	72_73_74_75 ehgk	72_73_74_75 ehgr	72_73_74_75 ehgK
Total	12	12	0	0	0	0	0	0	0	0
Mururoa	2	2	0	0	0	0	0	0	0	0
Tahiti	10	10	0	0	0	0	0	0	0	0

Table 17: Number of data points and model scores for Northeastern Australia (MIS3 - MIS4)

Location	number data	marine limiting	terrestrial limiting	index point	72_73_74_75 ehgA	72_73_74_75 ehgC	72_73_74_75 ehgG	72_73_74_75 ehgk	72_73_74_75 ehgr	72_73_74_75 ehgK
Total	25	13	0	12	671	671	665	654	636	631
Cairns	19	7	0	12	671	671	665	654	636	631
Mackay	6	6	0	0	0	0	0	0	0	0

Table 18: Number of data points and model scores for Papua New Guinea (MIS3 - MIS4)

Location	number data	marine limiting	terrestrial limiting	index point	72_73_74_75 ehgA	72_73_74_75 ehgC	72_73_74_75 ehgG	72_73_74_75 ehgk	72_73_74_75 ehgr	72_73_74_75 ehgK
Total	41	41	0	0	2	2	2	4	6	7
Huon Peninsula	41	41	0	0	2	2	2	4	6	7

Table 19: Number of data points and model scores for Sundaland (MIS3 - MIS4)

Location	number data	marine limiting	terrestrial limiting	index point	72_73_74_75 ehgA	72_73_74_75 ehgC	72_73_74_75 ehgG	72_73_74_75 ehgk	72_73_74_75 ehgr	72_73_74_75 ehgK
Total	29	14	13	2	235	233	229	227	226	227
Sunda Shelf	11	7	3	1	135	133	127	120	111	110
Vietnam Shelf	1	1	0	0	0	0	0	0	0	0
Strait Of Malacca	11	2	9	0	37	35	31	27	23	23
Mekong Delta	1	1	0	0	9	9	11	13	15	16
Chao Phraya	3	3	0	0	41	43	47	53	61	62
Berhala Strait	2	0	1	1	13	13	13	14	16	16

Table 20: Number of data points and model scores for Yellow Sea (MIS3 - MIS4)

Location	number data	marine limiting	terrestrial limiting	index point	72_73_74_75 ehgA	72_73_74_75 ehgC	72_73_74_75 ehgG	72_73_74_75 ehgk	72_73_74_75 ehgr	72_73_74_75 ehgK
Total	11	11	0	0	0	0	0	0	3	3
South Bohai Sea	4	4	0	0	0	0	0	0	3	3
Yellow Sea	7	7	0	0	0	0	0	0	0	0

4.7 North America

Table 21: Number of data points and model scores for Eastern United States

Location	number data	marine limiting	terrestrial limiting	index point	72_73_74_75 ehgA	72_73_74_75 ehgC	72_73_74_75 ehgG	72_73_74_75 ehgk	72_73_74_75 ehgr	72_73_74_75 ehgK
Total	357	138	38	181	1389	1610	1485	1206	1240	1315
Outer Delaware	60	5	5	50	287	325	280	237	273	299
Inner Delaware	38	2	8	28	134	162	135	110	137	155
Inner Chesapeake	106	99	0	7	431	423	315	262	303	329
Eastern Shore	28	7	6	15	59	83	87	74	79	85
Northern North Carolina	60	23	6	31	329	385	364	287	271	278
Southern North Carolina	24	2	3	19	25	43	63	51	42	41
Northern South Carolina	18	0	8	10	49	76	94	72	55	53
Southern South Carolina	23	0	2	21	75	113	147	113	80	75

Table 22: Number of data points and model scores for Gulf of St Lawrence

Location	number data	marine limiting	terrestrial limiting	index point	72_73_74_75 ehgA	72_73_74_75 ehgC	72_73_74_75 ehgG	72_73_74_75 ehgk	72_73_74_75 ehgr	72_73_74_75 ehgK
Total	108	38	32	38	1187	1211	1227	968	588	521
Cape Breton	16	4	7	5	35	11	39	43	3	3
Magdalen Islands	22	2	11	9	107	122	143	118	62	44
Prince Edward Island	31	9	6	16	338	262	189	143	113	136
Chaleur Bay	15	10	5	0	7	20	45	28	5	3
Anticosti Island	24	13	3	8	700	796	811	636	405	335

Table 23: Number of data points and model scores for Hudson Bay

Location	number data	marine limiting	terrestrial limiting	index point	72_73_74_75 ehgA	72_73_74_75 ehgC	72_73_74_75 ehgG	72_73_74_75 ehgk	72_73_74_75 ehgr	72_73_74_75 ehgK
Total	243	113	68	62	9557	10667	10936	8829	5913	5212
Kivalliq	31	21	5	5	397	486	556	477	331	273
Churchill	23	9	7	7	681	860	933	706	343	218
West James Bay	17	4	10	3	740	859	902	641	286	198
East James Bay	36	20	9	7	1801	2008	2097	1739	1223	1097
Umiujaq	94	34	33	27	5464	5850	5786	4780	3466	3097
Inukjuak	21	11	2	8	263	343	411	360	254	215
Ivujivik	21	14	2	5	211	261	251	126	10	114

Table 24: Number of data points and model scores for Hudson Strait

Location	number data	marine limiting	terrestrial limiting	index point	72_73_74_75 ehgA	72_73_74_75 ehgC	72_73_74_75 ehgG	72_73_74_75 ehgk	72_73_74_75 ehgr	72_73_74_75 ehgK
Total	86	65	18	3	921	1046	1014	737	1026	1438
Sugluk	40	30	10	0	114	176	191	108	460	821
Kangiqsujuaq	14	13	1	0	3	9	13	9	142	262
Western Ungava Bay	21	17	4	0	260	279	251	193	178	172
Southern Ungava Bay	11	5	3	3	544	582	559	427	246	183

Table 25: Number of data points and model scores for Labrador

Location	number data	marine limiting	terrestrial limiting	index point	72_73_74_75 ehgA	72_73_74_75 ehgC	72_73_74_75 ehgG	72_73_74_75 ehgk	72_73_74_75 ehgr	72_73_74_75 ehgK
Total	61	16	45	0	510	576	583	407	359	373
Torngat	18	7	11	0	31	42	44	42	248	311
Nain	16	2	14	0	366	393	376	254	81	41
Hamilton Inlet	15	3	12	0	54	69	76	43	2	0
Lake Melville	12	4	8	0	59	72	87	68	28	21

Table 26: Number of data points and model scores for Maritimes

Location	number data	marine limiting	terrestrial limiting	index point	72_73_74_75 ehgA	72_73_74_75 ehgC	72_73_74_75 ehgG	72_73_74_75 ehgk	72_73_74_75 ehgr	72_73_74_75 ehgK
Total	207	30	40	137	1388	1189	770	482	323	427
Sable Island	10	1	6	3	55	44	35	17	17	24
Halifax	48	15	4	29	139	76	65	40	43	77
Shelburne	9	0	4	5	20	15	3	3	7	11
Cumberland	112	6	15	91	785	671	371	225	144	222
Passamaquoddy Bay	28	8	11	9	389	383	296	197	112	93

Table 27: Number of data points and model scores for Newfoundland

Location	number data	marine limiting	terrestrial limiting	index point	72_73_74_75 ehgA	72_73_74_75 ehgC	72_73_74_75 ehgG	72_73_74_75 ehgk	72_73_74_75 ehgr	72_73_74_75 ehgK
Total	160	53	61	46	1151	1220	1205	968	724	680
Great Northern Peninsula	56	16	23	17	158	133	75	33	102	152
Notre Dame Bay	29	12	13	4	127	136	124	97	65	56
Avalon Peninsula	13	3	5	5	8	8	3	0	2	3
Bay Of Islands	16	5	3	8	317	361	379	301	185	151
Port Aux Basques	46	17	17	12	541	582	624	537	370	318

Table 28: Number of data points and model scores for Northeastern United States

Location	number data	marine limiting	terrestrial limiting	index point	72_73_74_75 ehgA	72_73_74_75 ehgC	72_73_74_75 ehgG	72_73_74_75 ehgk	72_73_74_75 ehgr	72_73_74_75 ehgK
Total	479	51	117	311	3029	2603	1417	1273	1984	2388
Eastern Maine	49	0	4	45	457	362	128	91	173	229
Southern Maine	86	24	6	56	750	541	195	196	438	599
Northern Massachusetts	43	3	16	24	151	130	62	55	93	112
Southern Massachusetts	43	12	14	17	271	224	132	140	212	241
Connecticut	95	0	41	54	164	165	102	85	128	150
Long Island	25	0	6	19	284	249	171	165	212	231
New York	76	6	19	51	614	579	350	300	436	504
New Jersey	62	6	11	45	338	353	277	241	292	322

Table 29: Number of data points and model scores for St Laurence Lowlands

Location	number data	marine limiting	terrestrial limiting	index point	72_73_74_75 ehgA	72_73_74_75 ehgC	72_73_74_75 ehgG	72_73_74_75 ehgk	72_73_74_75 ehgr	72_73_74_75 ehgK
Total	218	53	50	115	5133	6185	7066	5019	2438	1837
Rimouski	90	17	15	58	3048	3520	3755	2727	1506	1128
Forestville	59	18	7	34	818	898	1096	869	505	392
Quebec City	69	18	28	23	1267	1767	2215	1423	427	317

4.8 Southeast Asia

Table 30: Number of data points and model scores for Java Sea

Location	number data	marine limiting	terrestrial limiting	index point	72_73_74_75 ehgA	72_73_74_75 ehgC	72_73_74_75 ehgG	72_73_74_75 ehgk	72_73_74_75 ehgr	72_73_74_75 ehgK
Total	47	18	2	27	191	191	190	181	198	205
Central Java	6	0	0	6	33	32	30	29	31	32
South Sulawesi	41	18	2	21	158	159	160	152	167	173

Table 31: Number of data points and model scores for Papua New Guinea

Location	number data	marine limiting	terrestrial limiting	index point	72_73_74_75 ehgA	72_73_74_75 ehgC	72_73_74_75 ehgG	72_73_74_75 ehgk	72_73_74_75 ehgr	72_73_74_75 ehgK
Total	56	56	0	0	13	13	13	13	23	26
Huon Peninsula	56	56	0	0	13	13	13	13	23	26

Table 32: Number of data points and model scores for Sundaland

Location	number data	marine limiting	terrestrial limiting	index point	72_73_74_75 ehgA	72_73_74_75 ehgC	72_73_74_75 ehgG	72_73_74_75 ehgk	72_73_74_75 ehgr	72_73_74_75 ehgK
Total	406	93	108	205	966	901	796	733	807	848
Chao Phraya	33	5	9	19	98	88	80	92	127	138
Mekong Delta	71	2	24	45	74	82	89	72	50	51
Strait Of Malacca	139	29	43	67	190	169	153	152	192	210
Sunda Shelf	53	12	9	32	324	306	241	194	176	173
Vietnam Shelf	5	1	0	4	26	26	23	15	9	8
Phuket	40	20	13	7	44	41	38	38	49	52
Thale Noi	3	0	1	2	10	9	9	10	12	13
West Malay Peninsula	2	2	0	0	1	1	1	0	1	1
East Malay Peninsula	4	3	1	0	8	6	5	5	8	9
Southeast Malay Peninsula	13	12	0	1	38	33	28	27	33	36
Belitung Island	25	0	0	25	123	112	102	100	115	120
Ca Na	18	7	8	3	30	28	27	28	35	37

5 Australia

5.1 Northeastern Australia

References for the data used in each location.

Cairns: Yokoyama et al. (2018)

Mackay: Yokoyama et al. (2018)

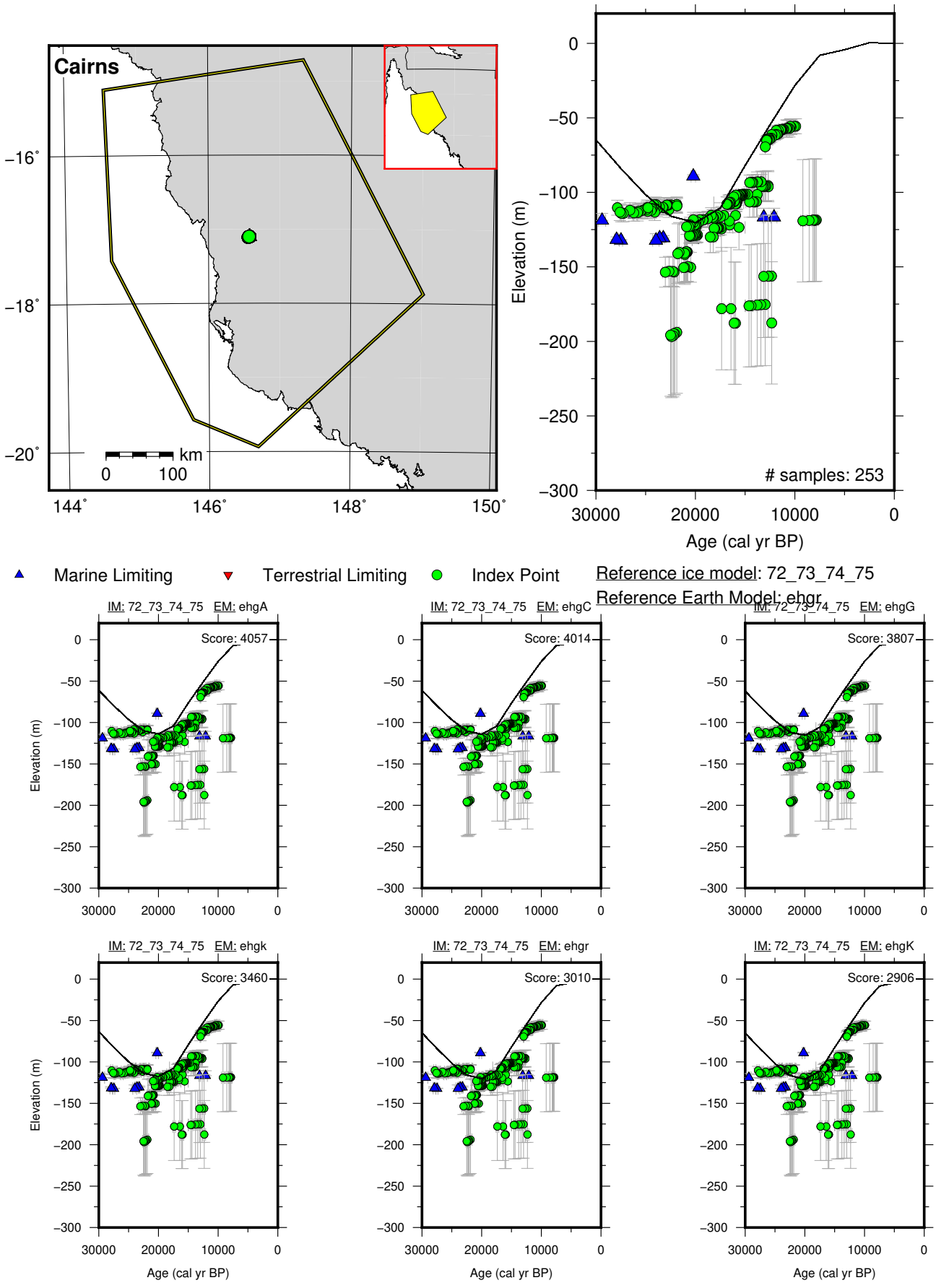


Figure 1: Paleo-sea level and comparison of six models for subregion Northeastern Australia, location Cairns.

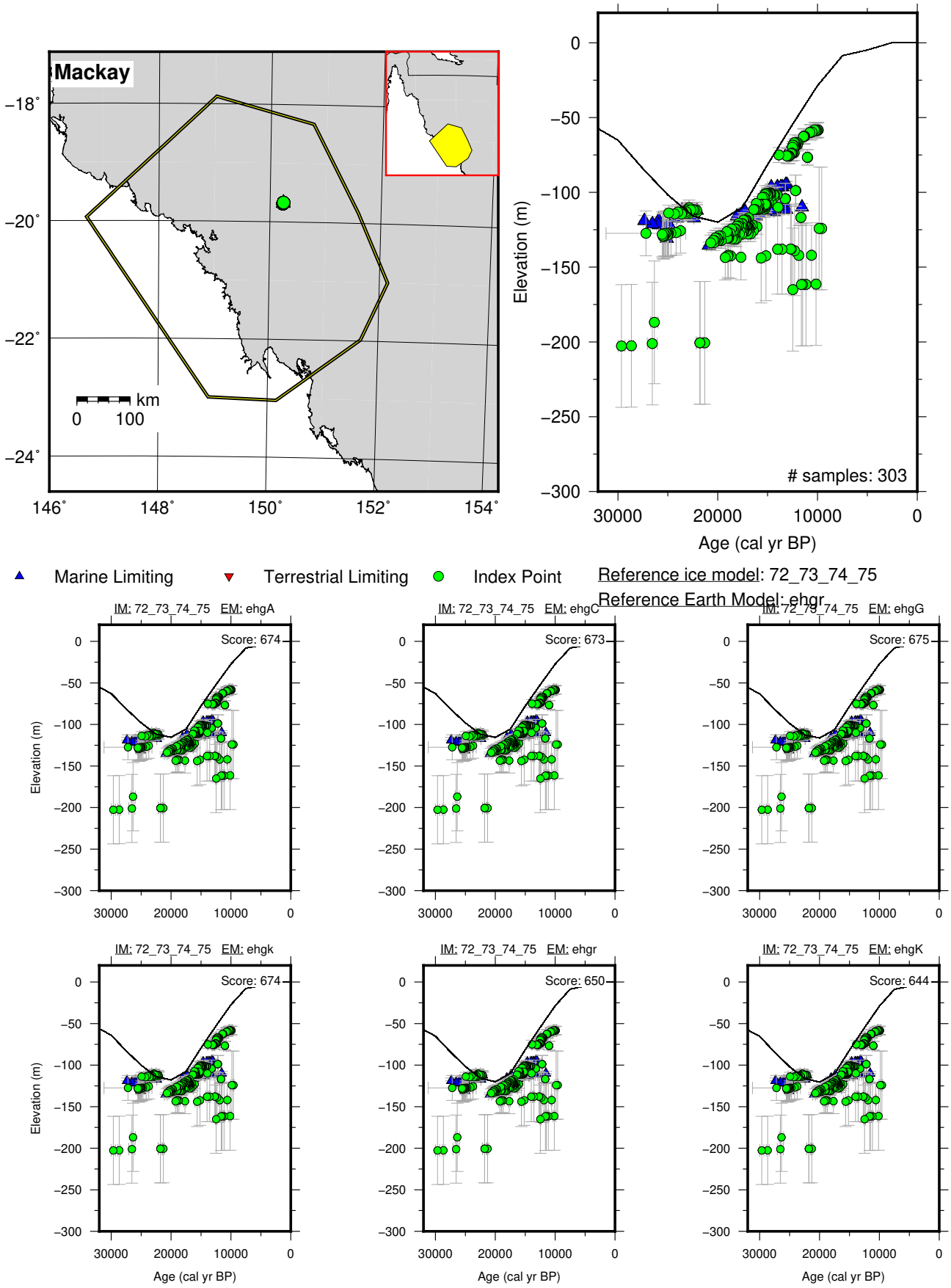
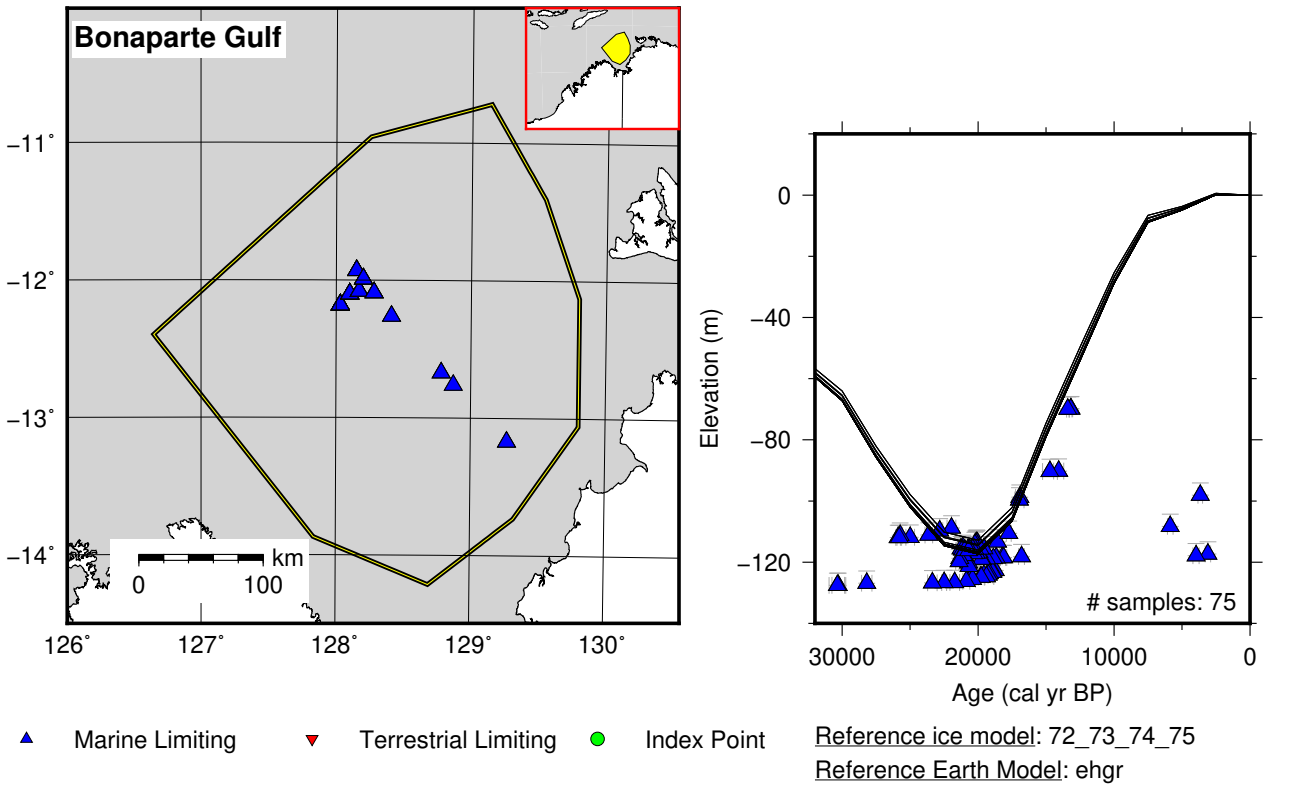


Figure 2: Paleo-sea level and comparison of six models for subregion Northeastern Australia, location Mackay.

5.2 Northwestern Australia

References for the data used in each location.

Bonaparte Gulf: Ishiwa et al. (2019)



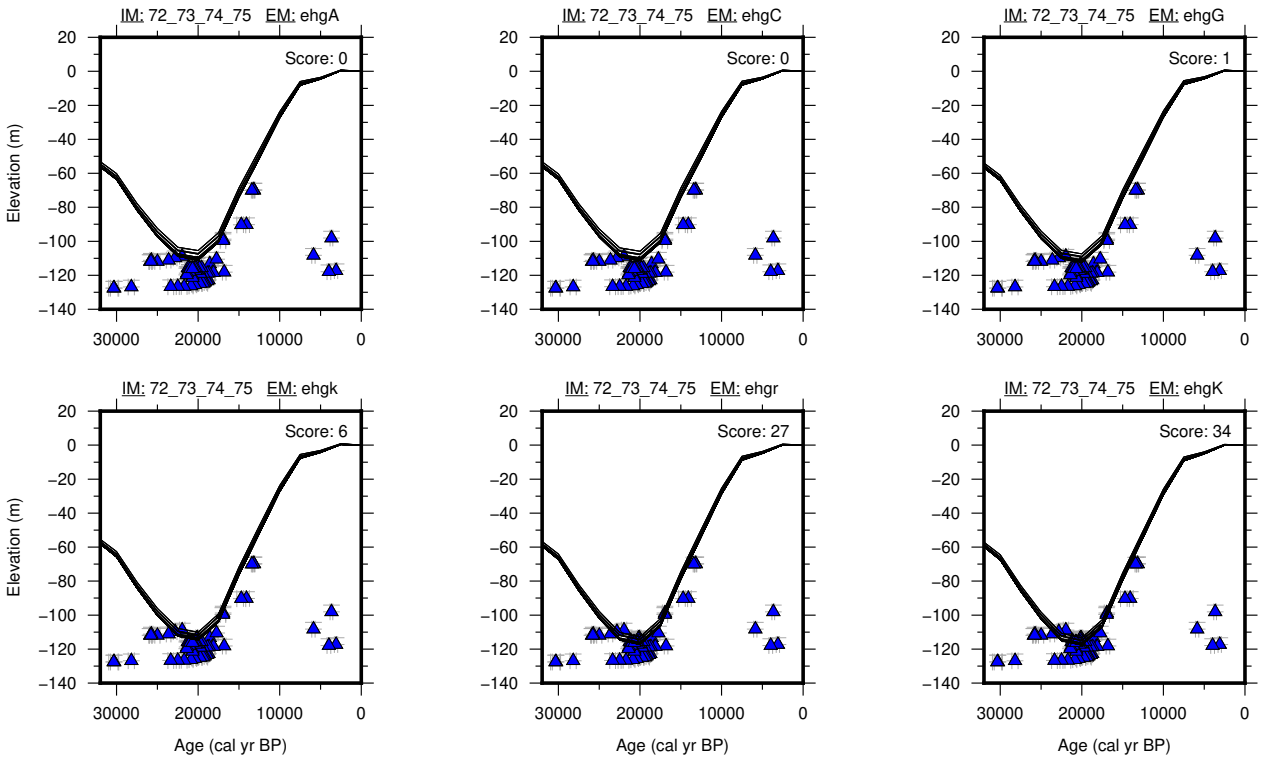


Figure 3: Paleo-sea level and comparison of six models for subregion Northwestern Australia, location Bonaparte Gulf.

6 Caribbean

6.1 Lesser Antilles

References for the data used in each location.

Barbados: Peltier and Fairbanks (2006)

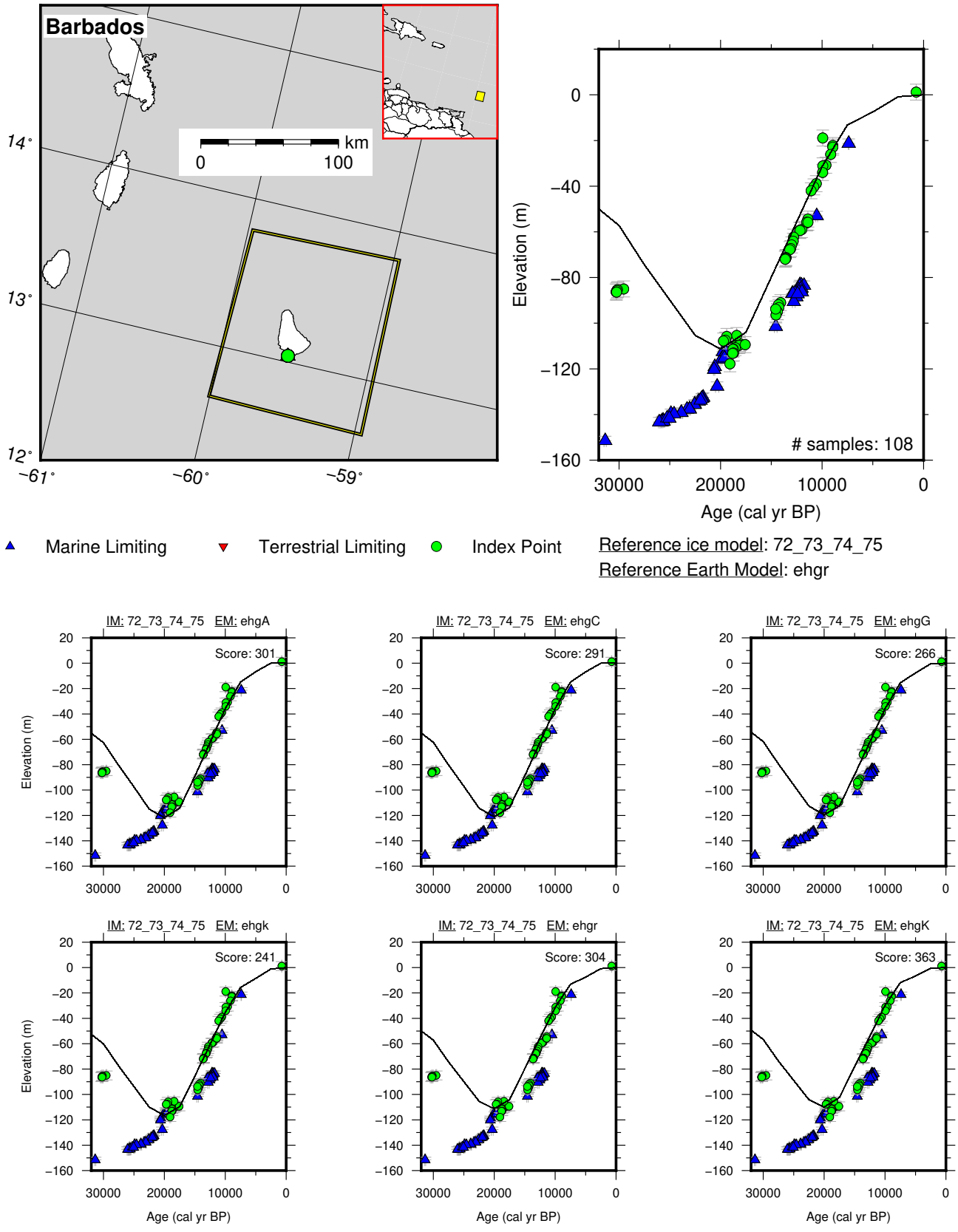


Figure 4: Paleo-sea level and comparison of six models for subregion Lesser Antilles, location Barbados.

7 Eurasian Arctic

7.1 Franz Josef Land

References for the data used in each location.

Zemlya Georga: Bolshiyanov et al. (2009); Dibner (1965); Forman et al. (1996, 2004); Glazovskiy et al. (1992); Grosswald (1973); Kovaleva (1974)

Zemlya Zichy: Bolshiyanov et al. (2009); Gusev et al. (2013b)

Proliv Markama: Bolshiyanov et al. (2009); Forman and Polyak (1997); Forman et al. (1996, 2004); Grosswald (1963, 1973); Gusev et al. (2013b); Kovaleva (1974); Lubinski (1998); Weihe (1996)

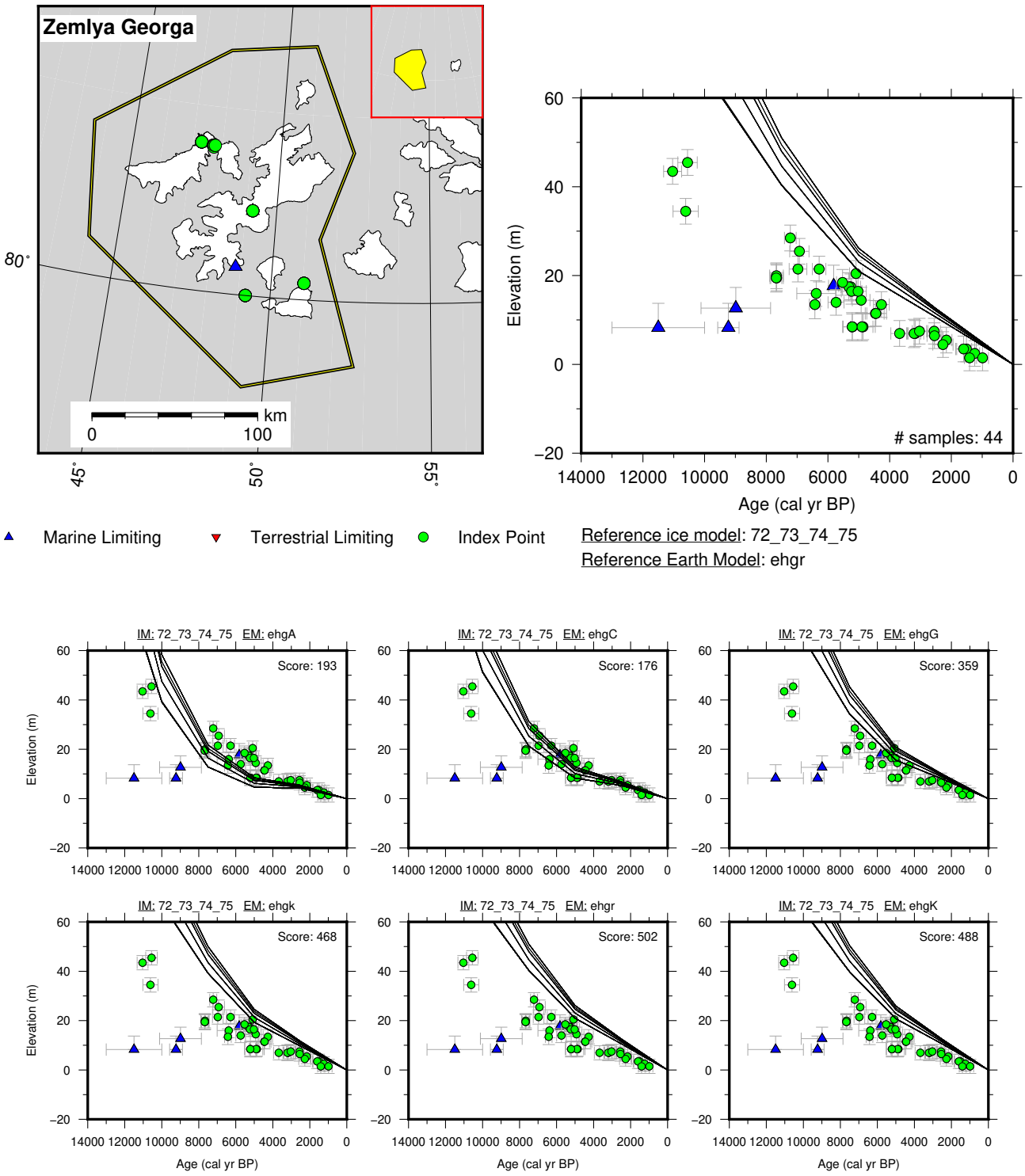
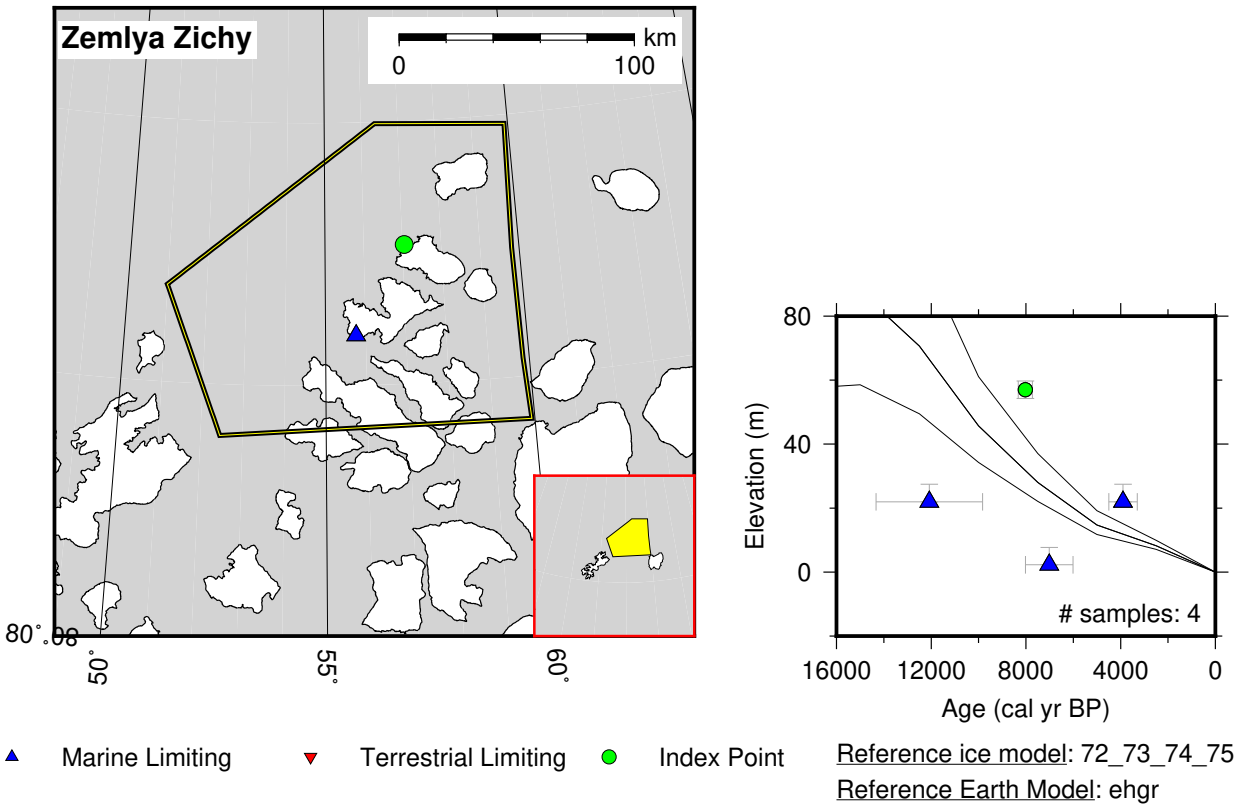


Figure 5: Paleo-sea level and comparison of six models for subregion Franz Josef Land, location Zemlya Georga.



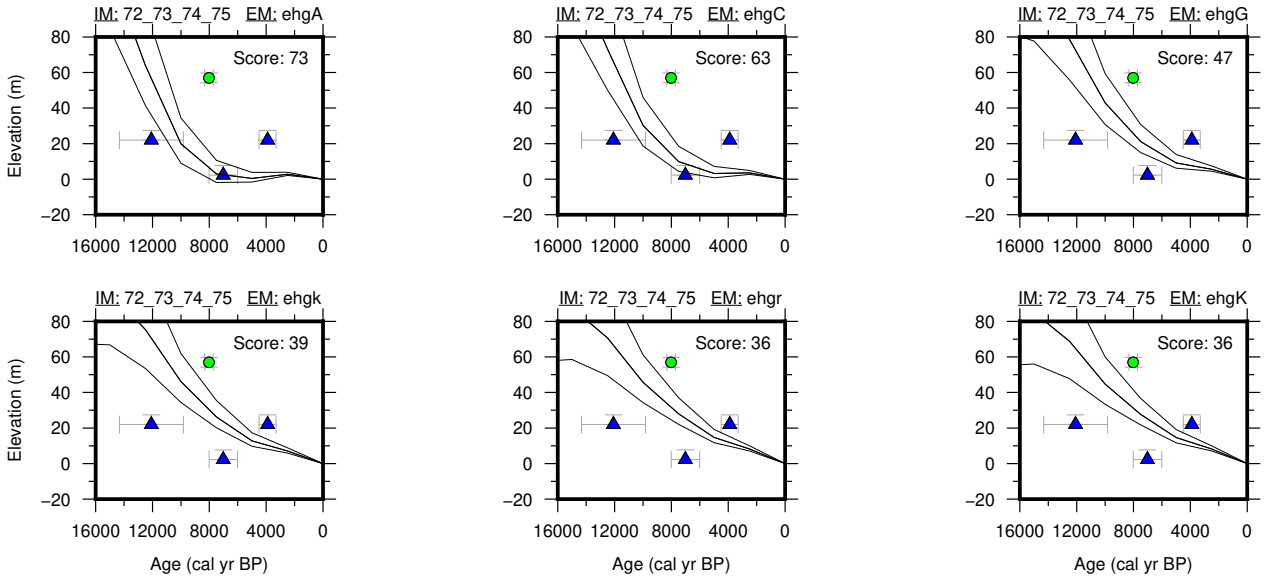


Figure 6: Paleo-sea level and comparison of six models for subregion Franz Josef Land, location Zemlya Zichy.

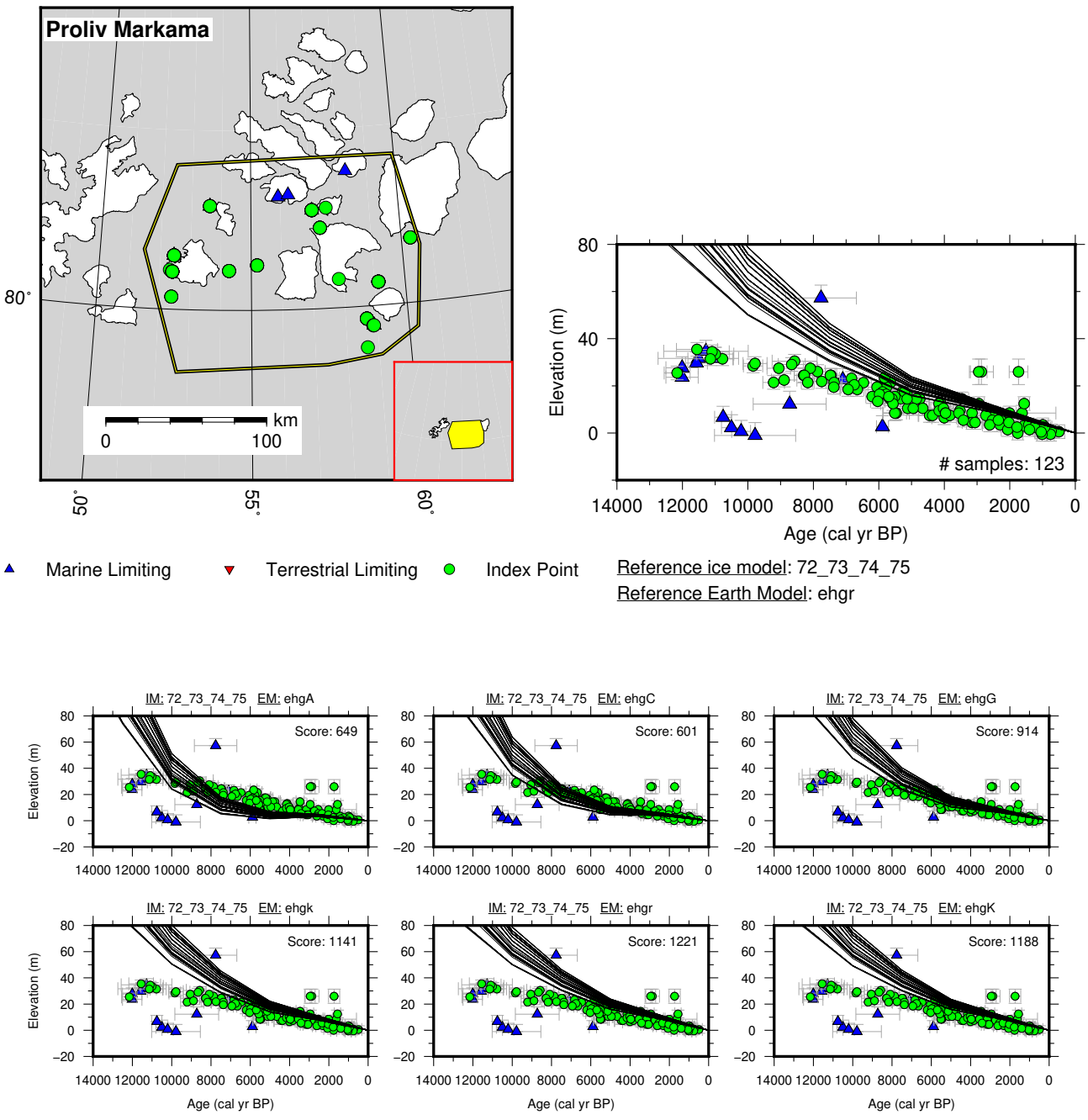


Figure 7: Paleo-sea level and comparison of six models for subregion Franz Josef Land, location Proliv Markama.

7.2 Kara Sea - Novaya Zemlya

References for the data used in each location.

Pechora Sea: Astakhov et al. (2007); Krapivner (2006); Polyak et al. (2000); Zhuravlev et al. (2013)

Yuzhny Island: Bolshiyanov et al. (2006); Mangerud et al. (2008); Zhuravlev et al. (2013)

Severny Island West: Bolshiyanov et al. (2009); Forman et al. (1999, 2004); Zeeberg et al. (2001)

Severny Island North: Forman et al. (1999, 2004); Gawronski and Zeeberg (1997); Zeeberg et al. (2001)

Vaygach Island: Forman et al. (2004); Zeeberg et al. (2001)

Baydaratskaya Bay: Belova (2012); Grigorieva (1987)

Gulf of Ob: Astakhov and Nazarov (2010); Grigorieva (1987); Makeev (1988); Makeev et al. (1988)

Khalmyer Bay: Baranskaya et al. (2018b); Grigorieva (1987); Makeev (1988); Romanenko et al. (2007)

Kara Sea shelf: Levitan et al. (2007); Polyakova and Stein (2004)

Ostrov Sibiryakova: Gusev et al. (2013a)

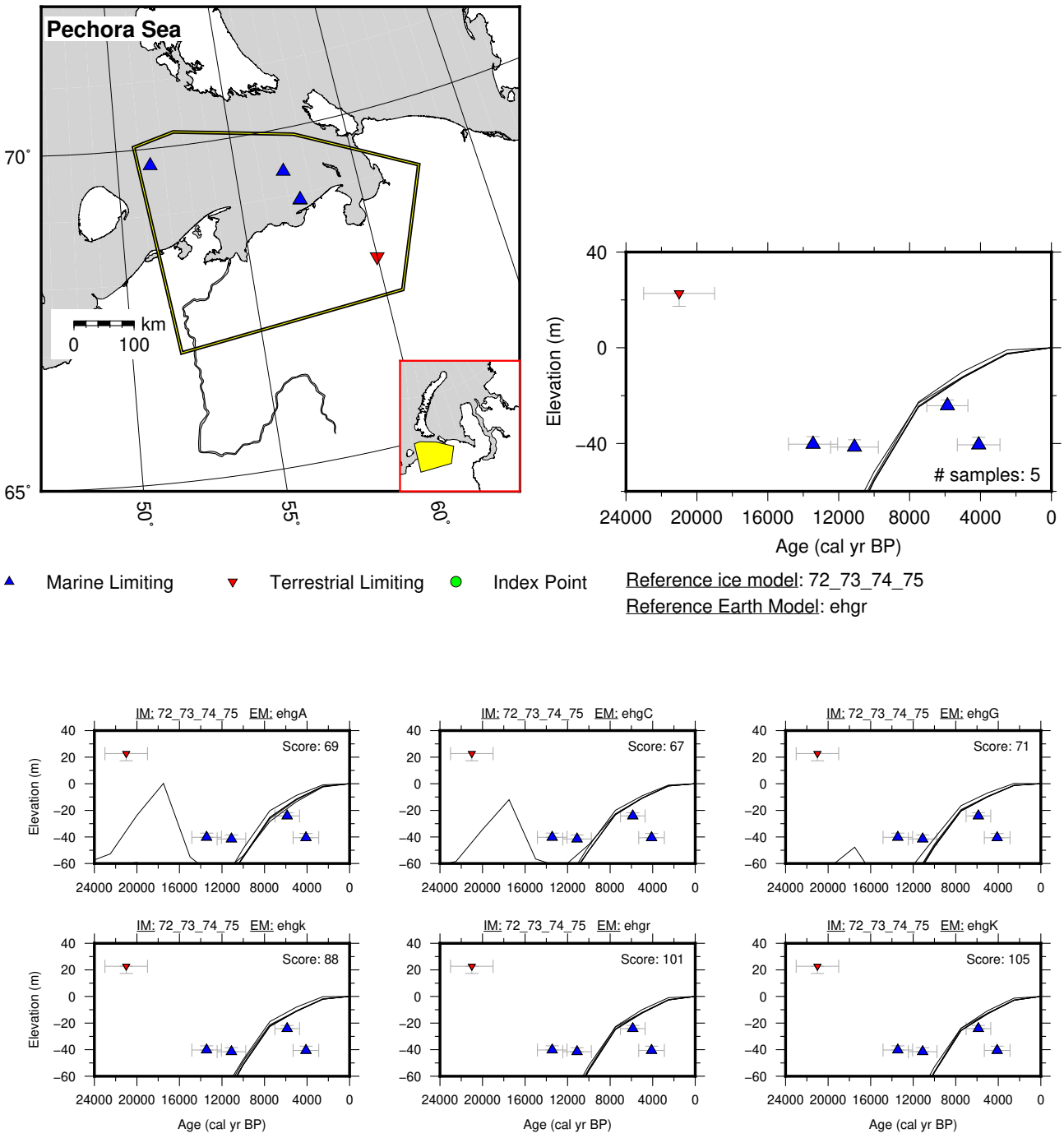
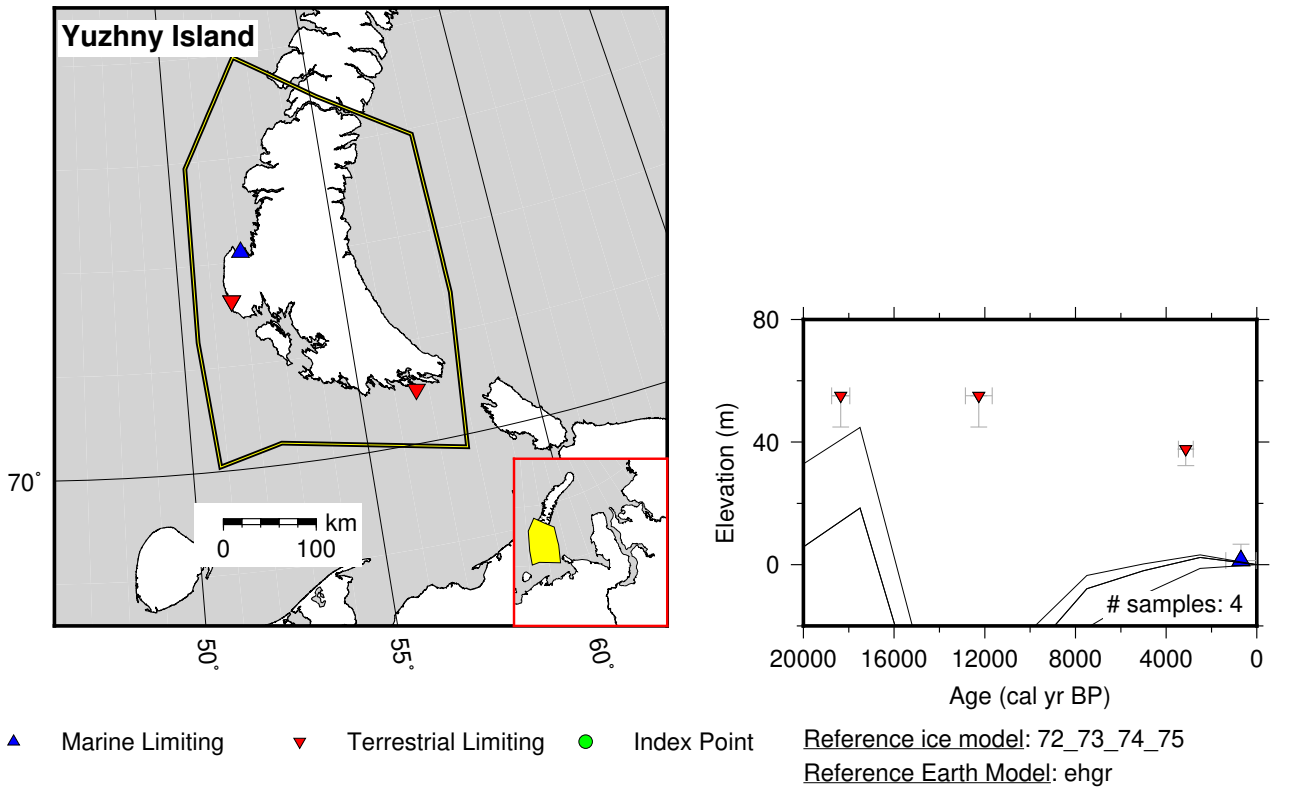


Figure 8: Paleo-sea level and comparison of six models for subregion Kara Sea - Novaya Zemlya, location Pechora Sea.



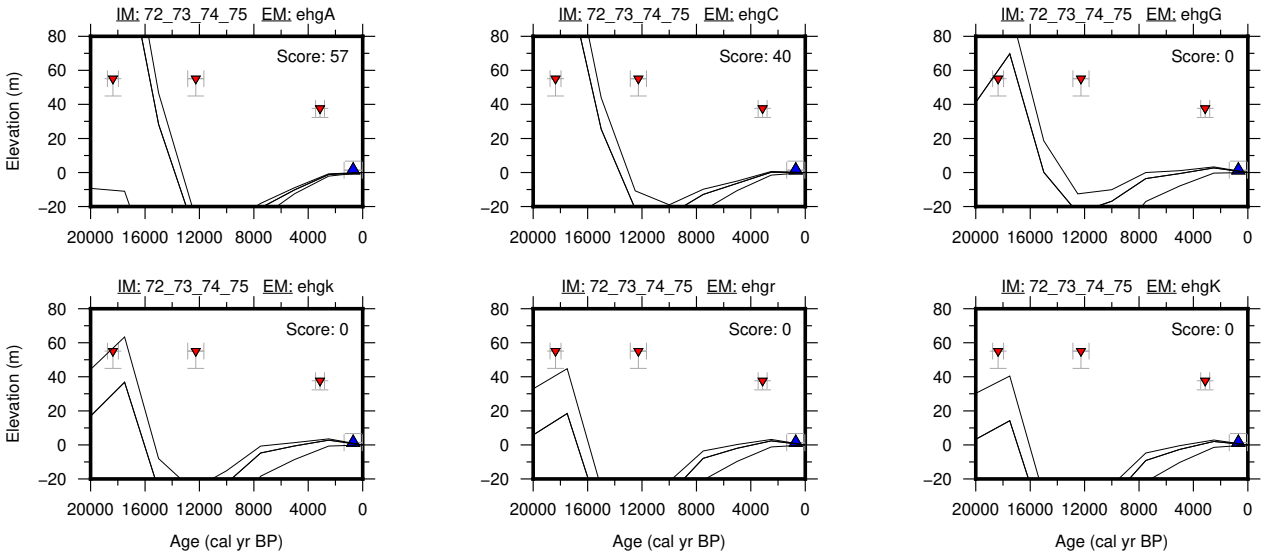


Figure 9: Paleo-sea level and comparison of six models for subregion Kara Sea - Novaya Zemlya, location Yuzhny Island.

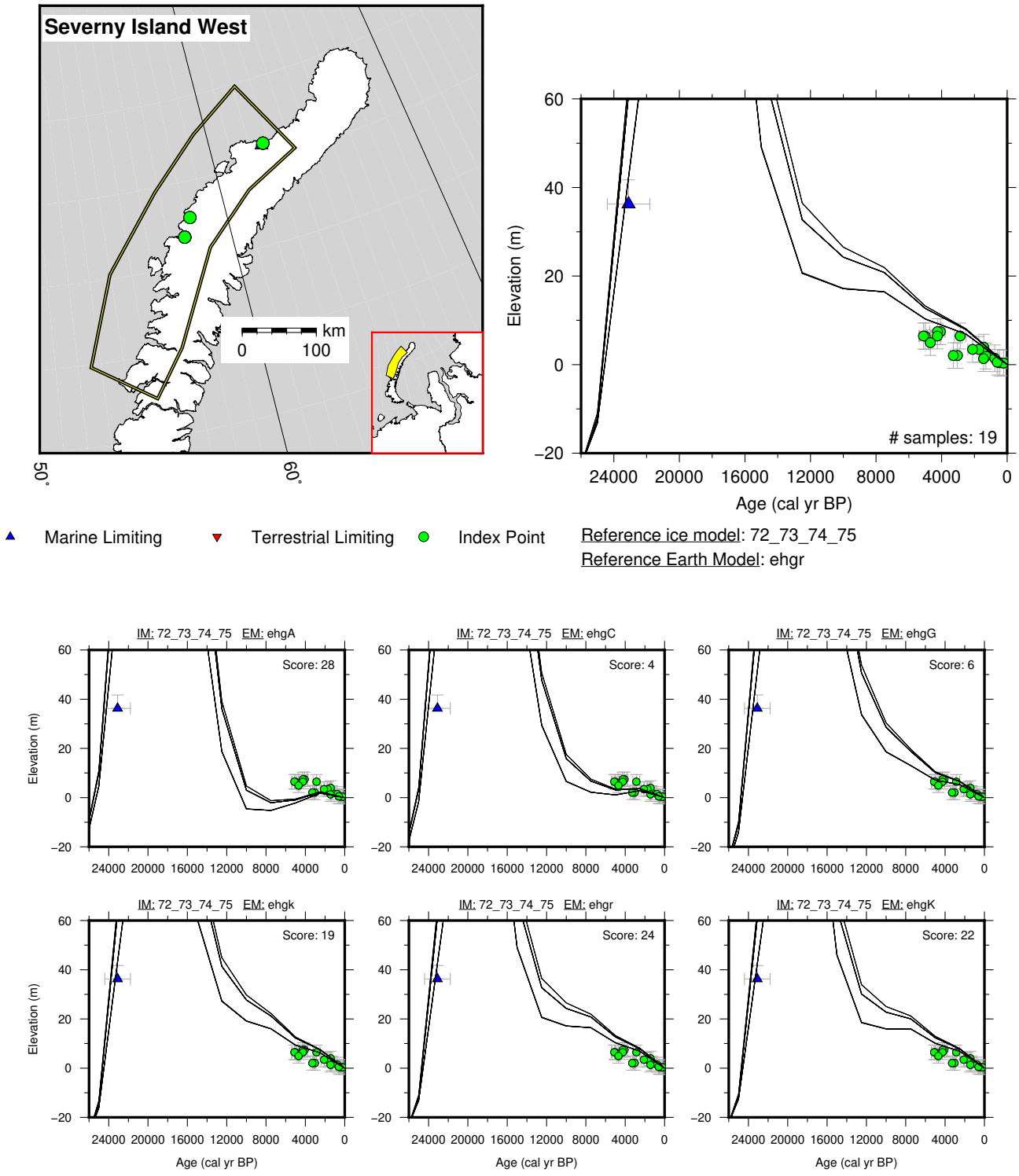


Figure 10: Paleo-sea level and comparison of six models for subregion Kara Sea - Novaya Zemlya, location Severny Island West.

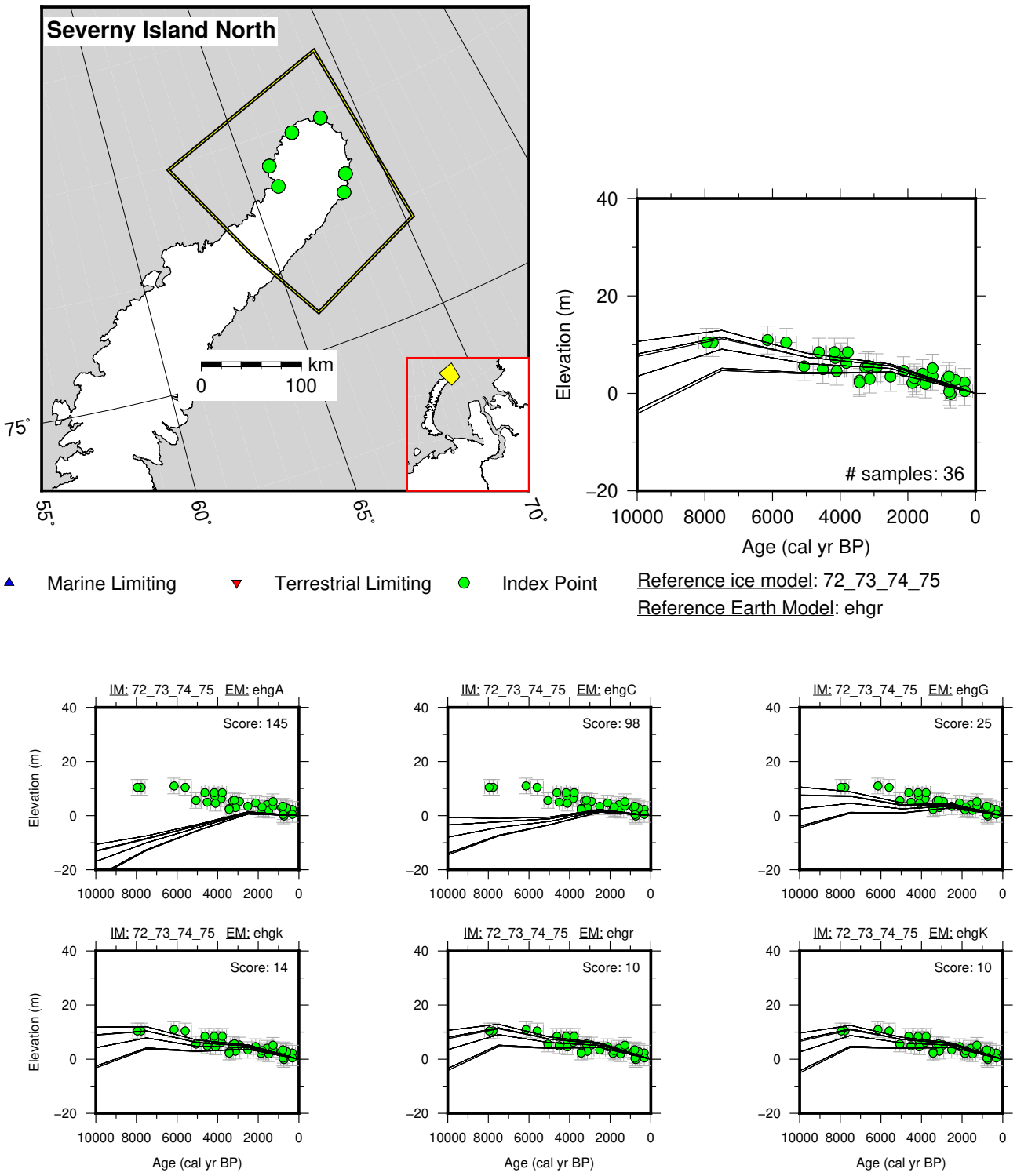
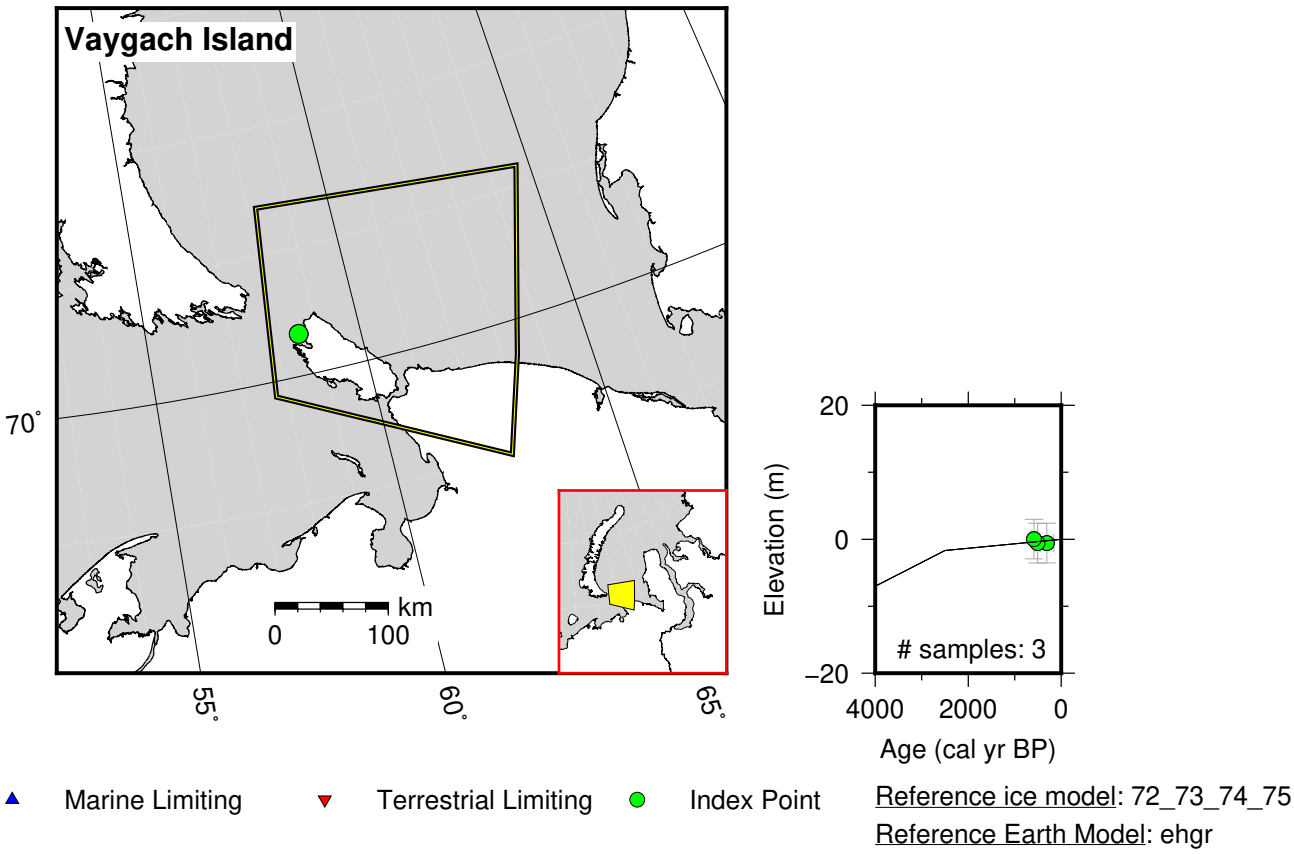


Figure 11: Paleo-sea level and comparison of six models for subregion Kara Sea - Novaya Zemlya, location Severny Island North.



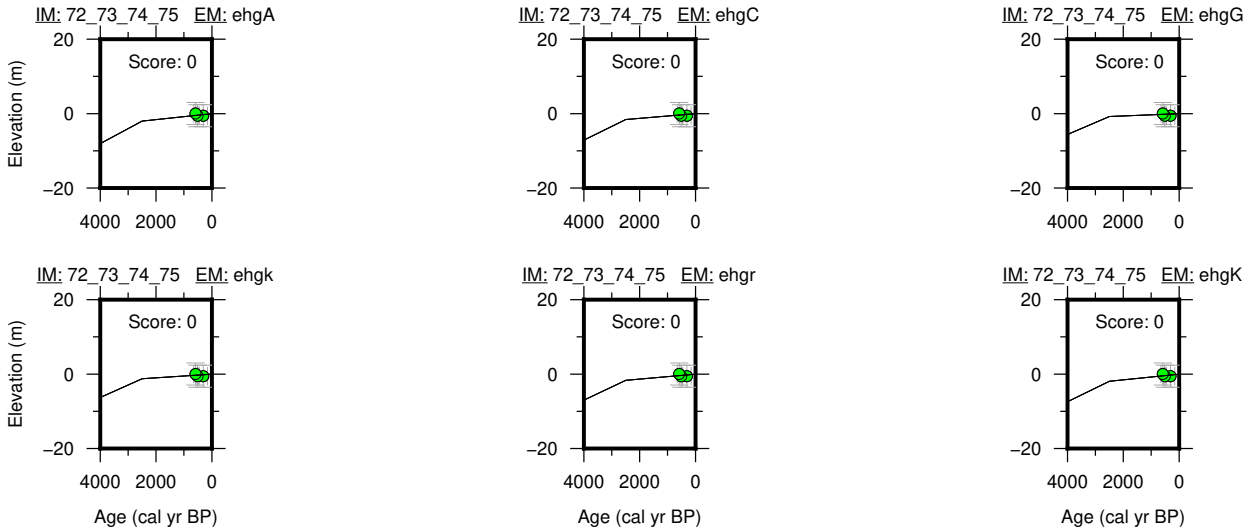
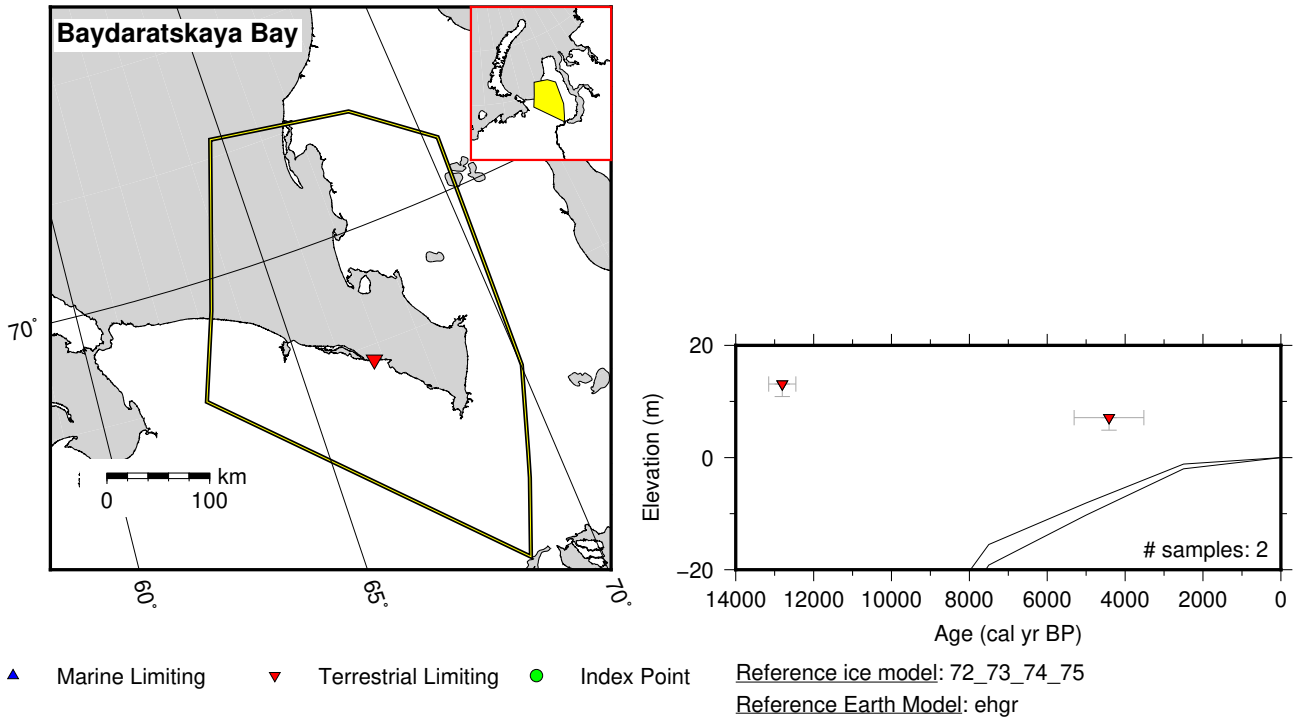


Figure 12: Paleo-sea level and comparison of six models for subregion Kara Sea - Novaya Zemlya, location Vaygach Island.



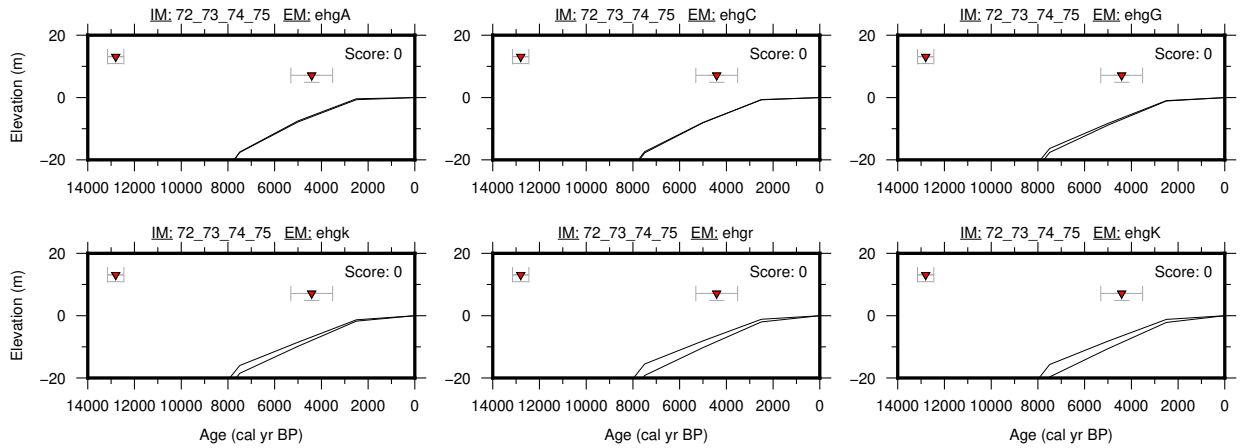


Figure 13: Paleo-sea level and comparison of six models for subregion Kara Sea - Novaya Zemlya, location Baydaratskaya Bay.

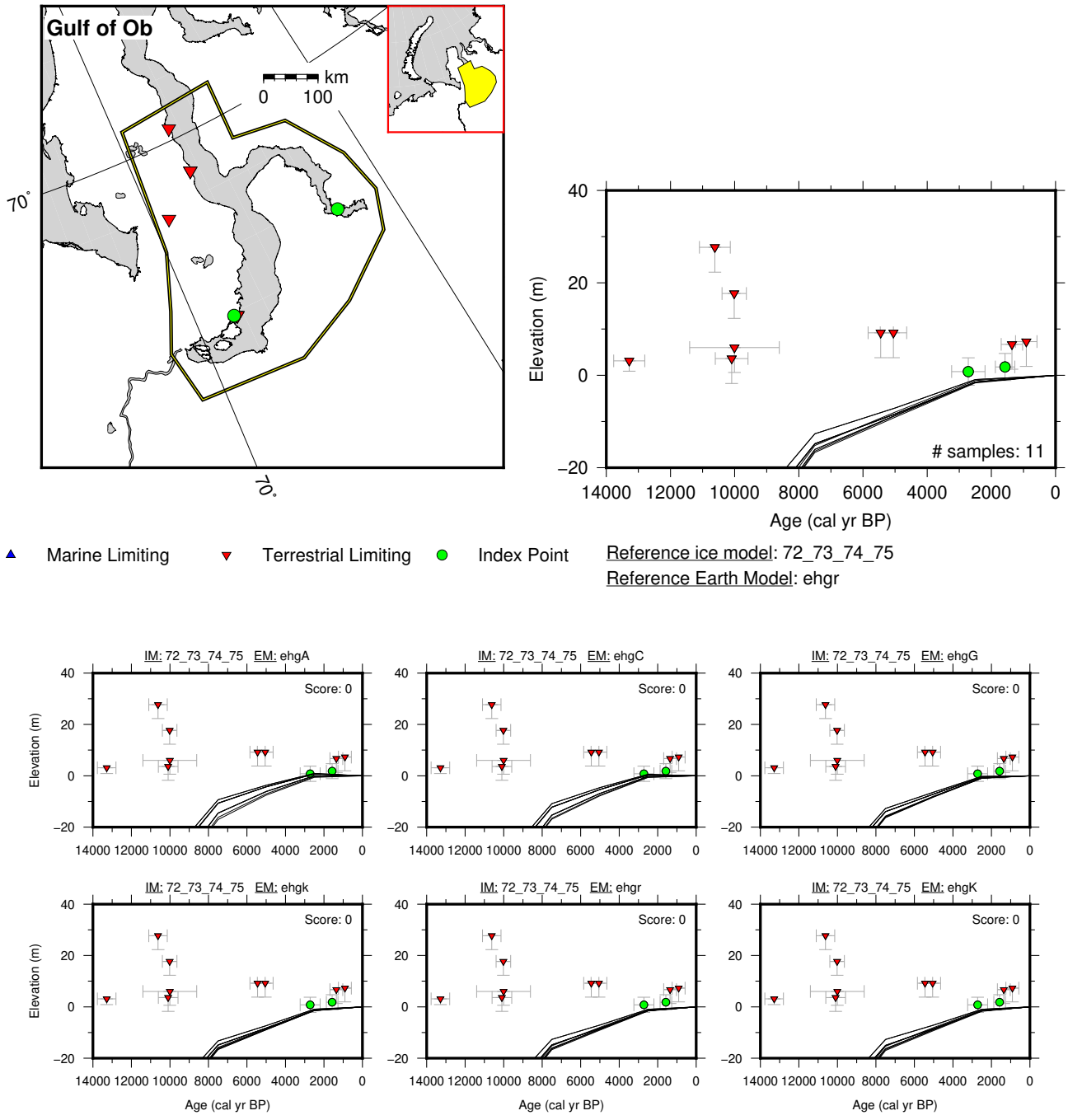
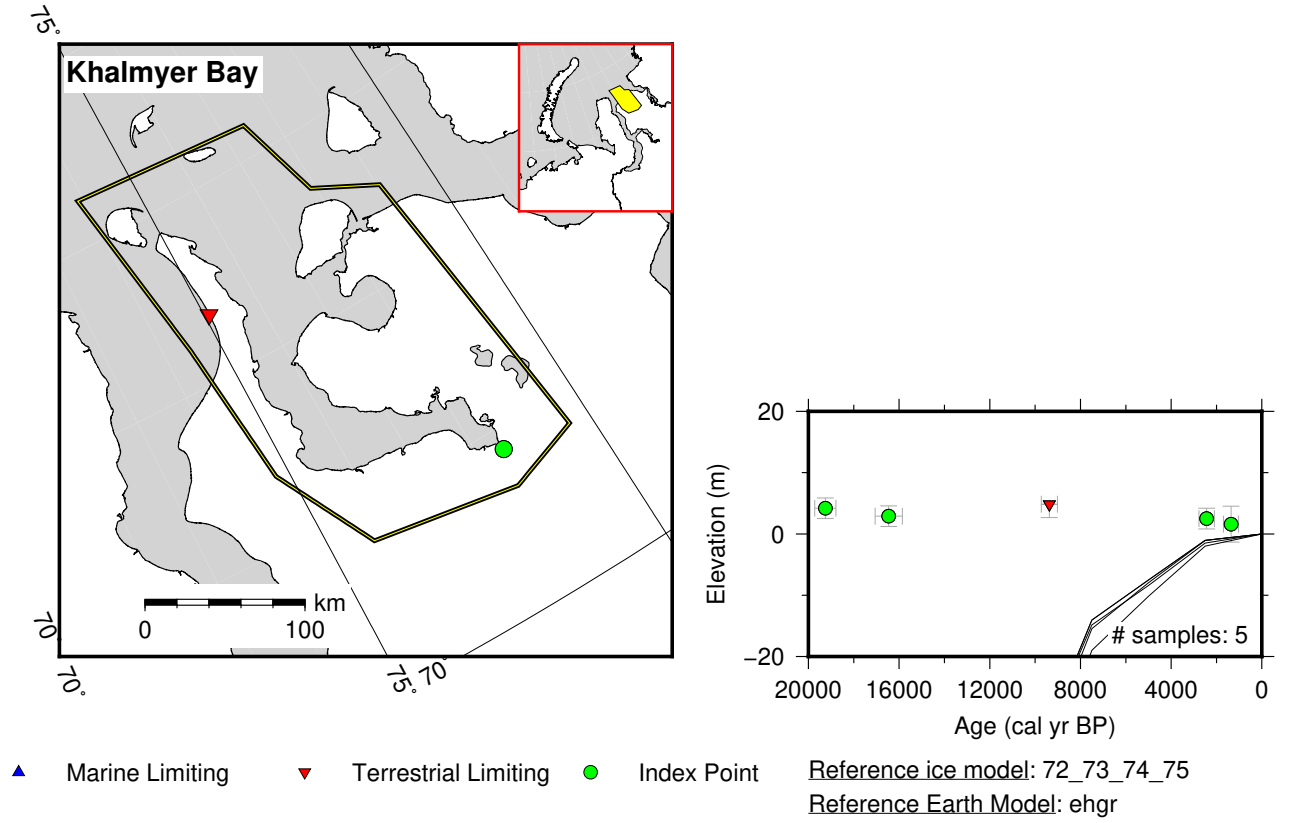


Figure 14: Paleo-sea level and comparison of six models for subregion Kara Sea - Novaya Zemlya, location Gulf of Ob.



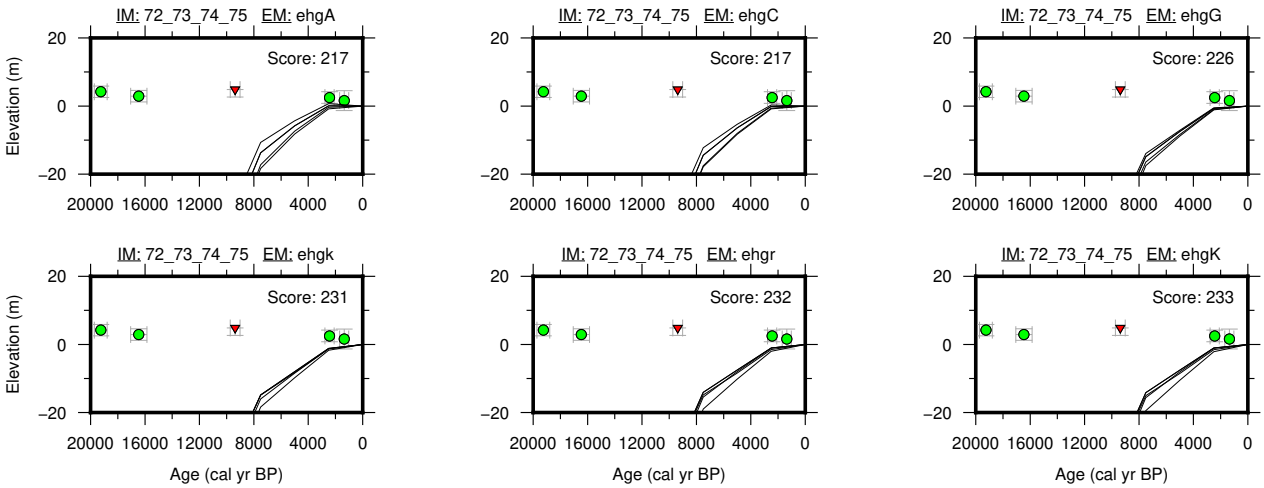


Figure 15: Paleo-sea level and comparison of six models for subregion Kara Sea - Novaya Zemlya, location Khalmyer Bay.

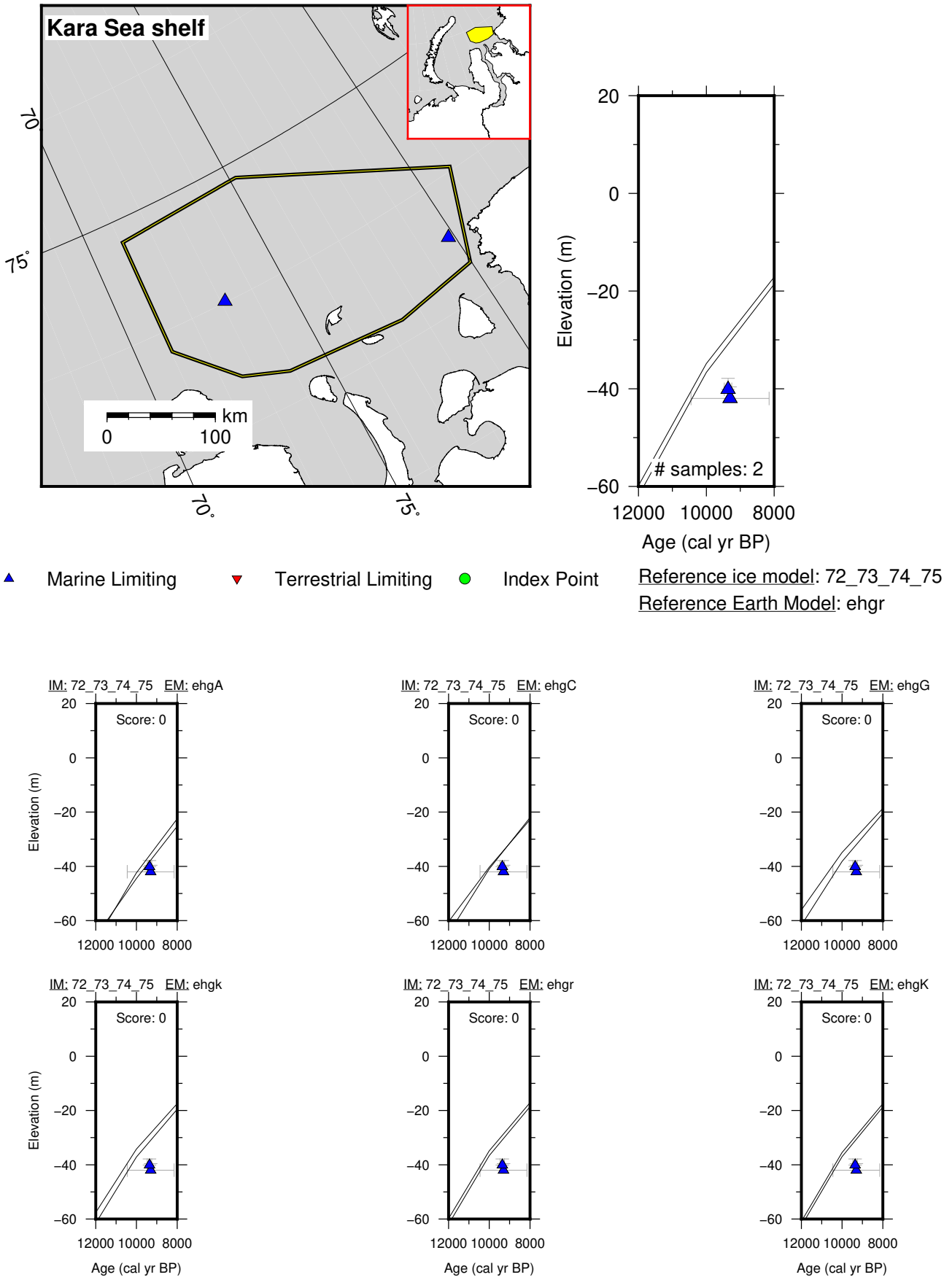
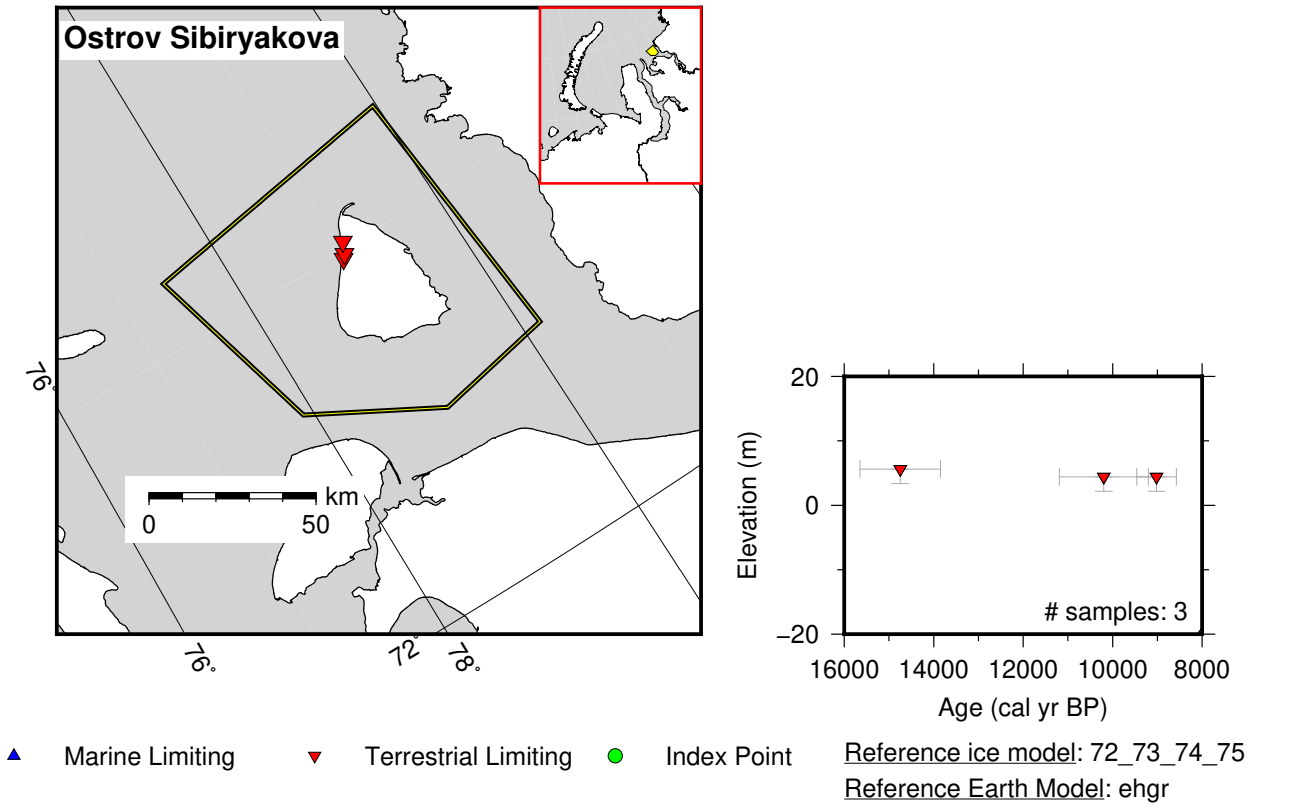


Figure 16: Paleo-sea level and comparison of six models for subregion Kara Sea - Novaya Zemlya, location Kara Sea shelf.



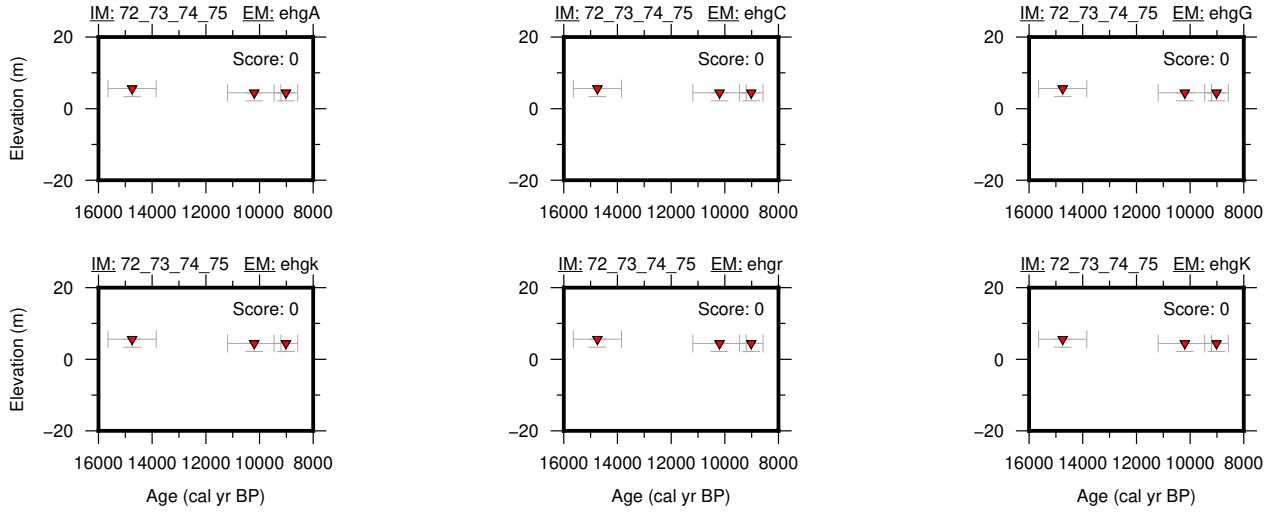


Figure 17: Paleo-sea level and comparison of six models for subregion Kara Sea - Novaya Zemlya, location Ostrov Sibiryakova.

7.3 Southern Barents Sea

References for the data used in each location.

Rolfsoya: Romundset et al. (2011)

Norkinn: Romundset et al. (2011)

Pechengsky: Arslanov et al. (1974); Corner et al. (1999); Koshechkin (1979)

Murmansk: Arslanov et al. (1974); Corner et al. (2001); Gurevich and Liyva (1975); Gurina (1971); Mityaev M. V. (2008); Tanner (1907)

Voronya River: Arslanov et al. (1974); Snyder et al. (1997)

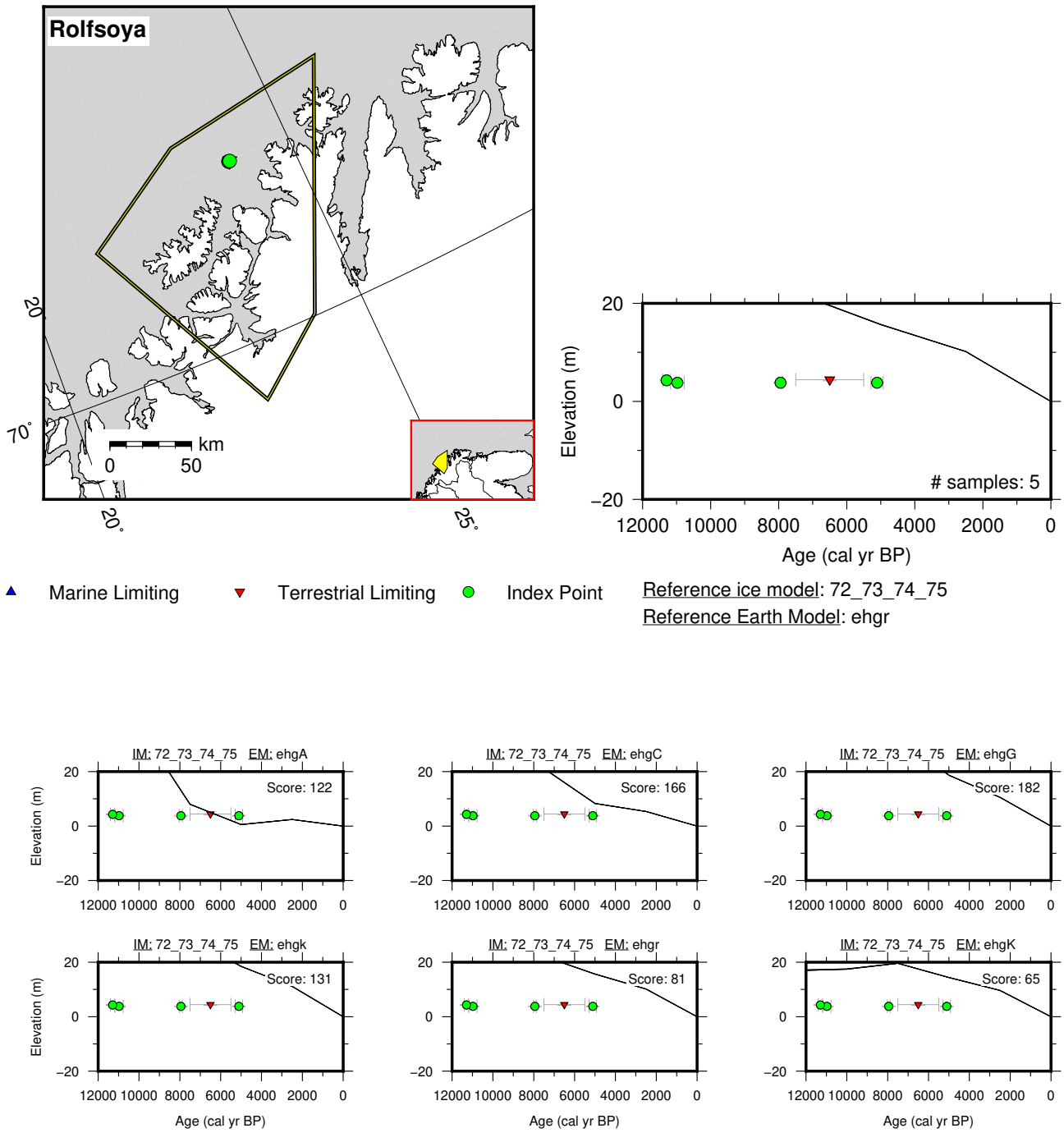


Figure 18: Paleo-sea level and comparison of six models for subregion Southern Barents Sea, location Rolfsoya.

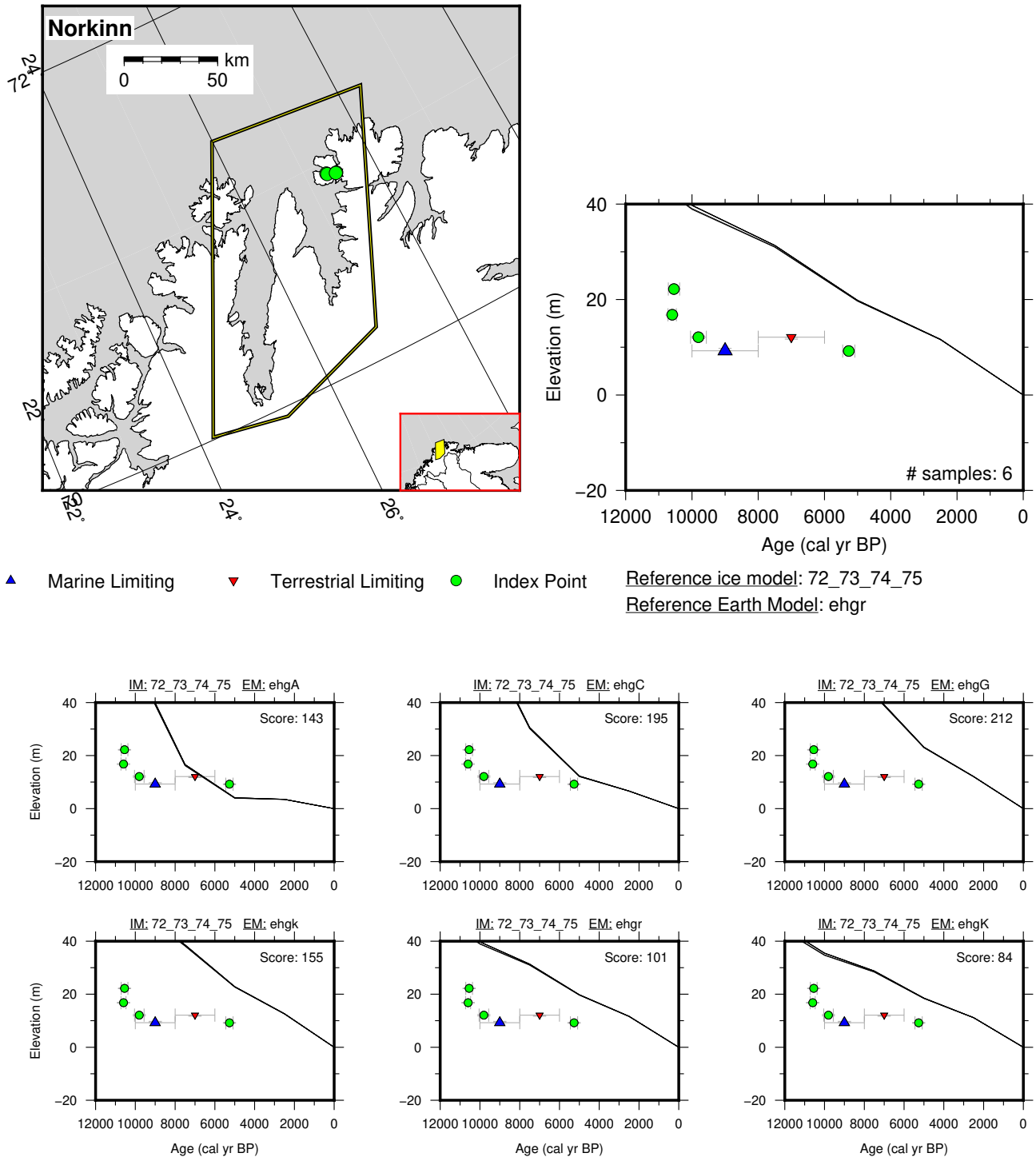


Figure 19: Paleo-sea level and comparison of six models for subregion Southern Barents Sea, location Norkinn.

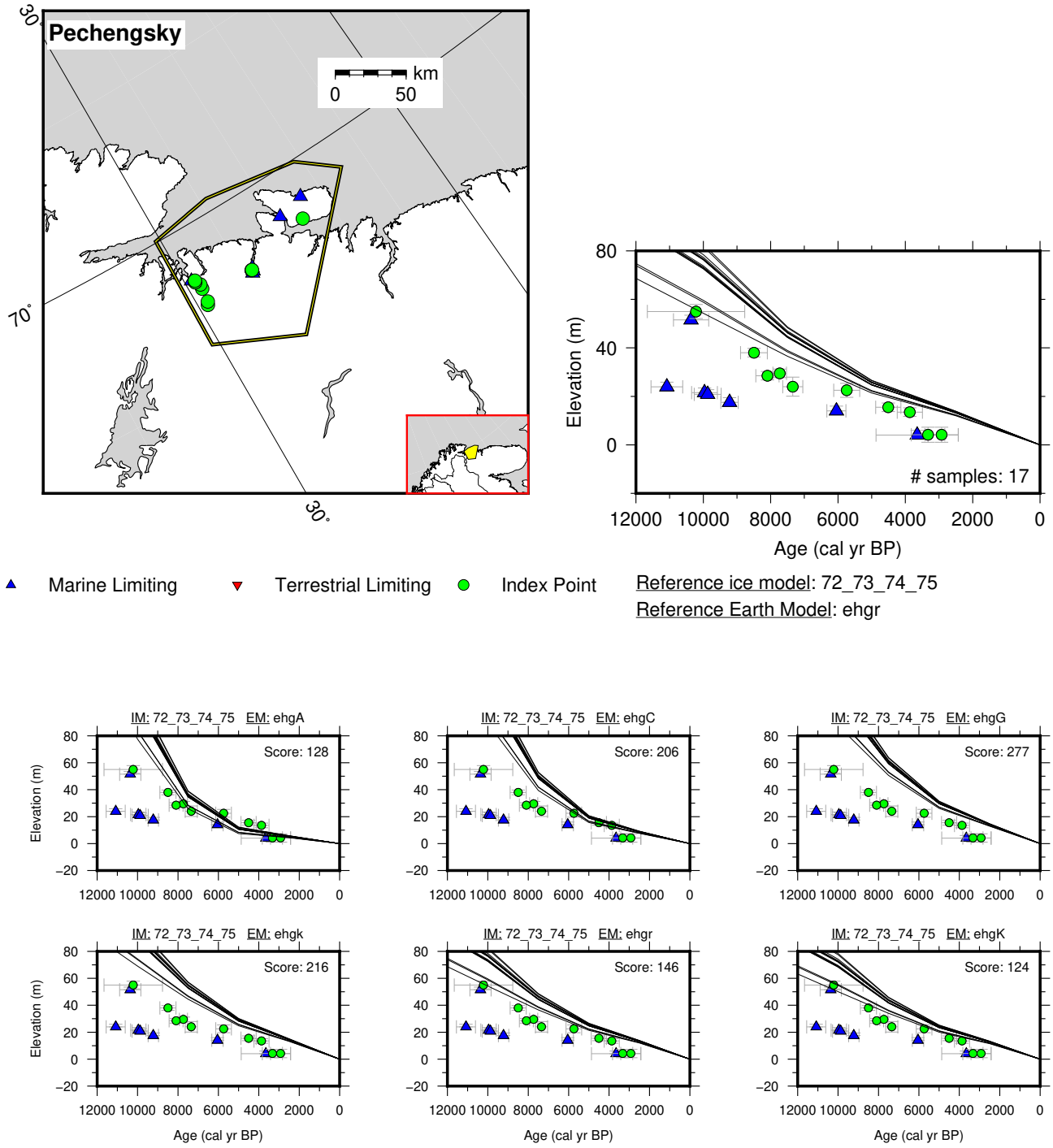


Figure 20: Paleo-sea level and comparison of six models for subregion Southern Barents Sea, location Pechengsky.

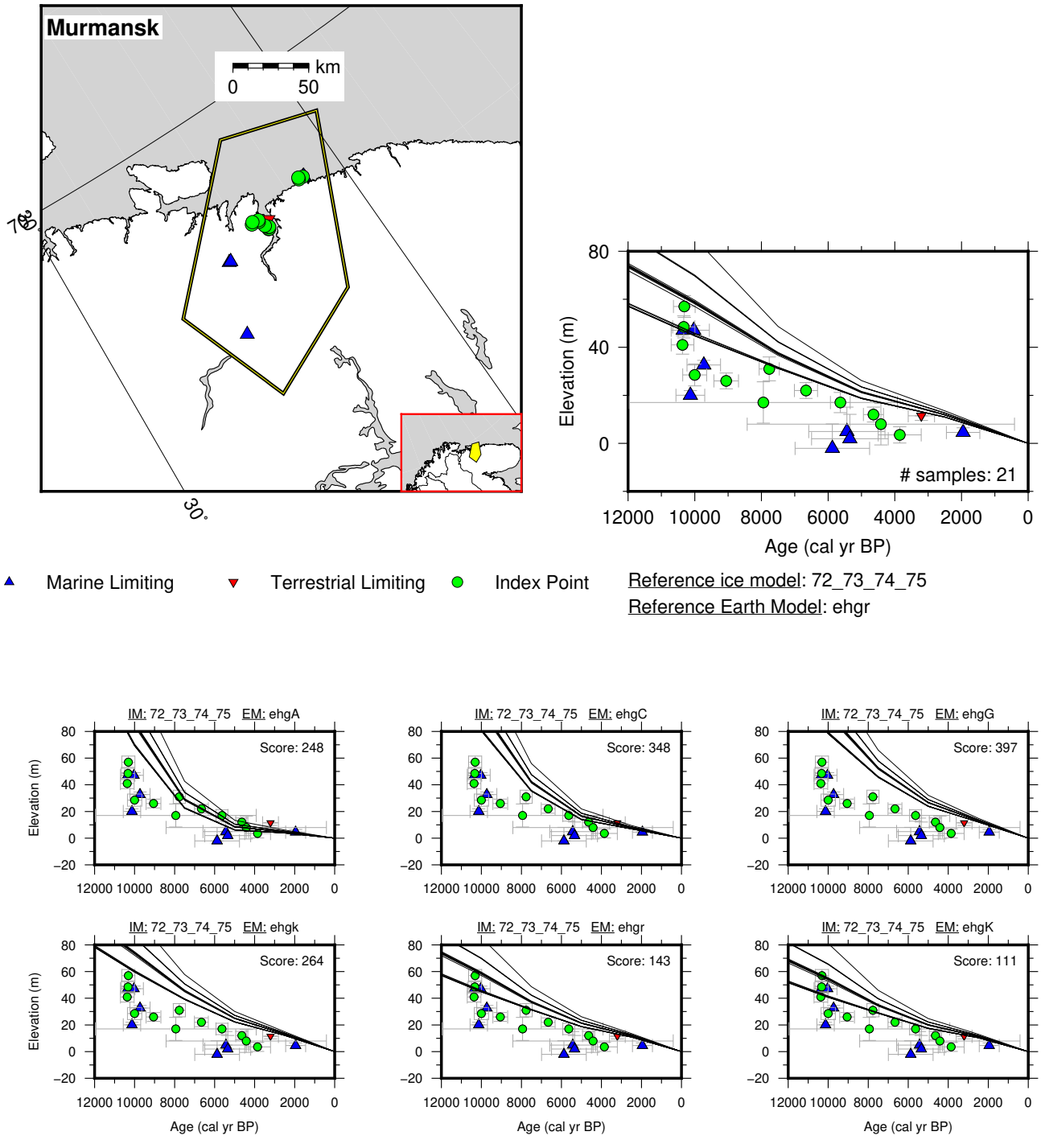


Figure 21: Paleo-sea level and comparison of six models for subregion Southern Barents Sea, location Murmansk.

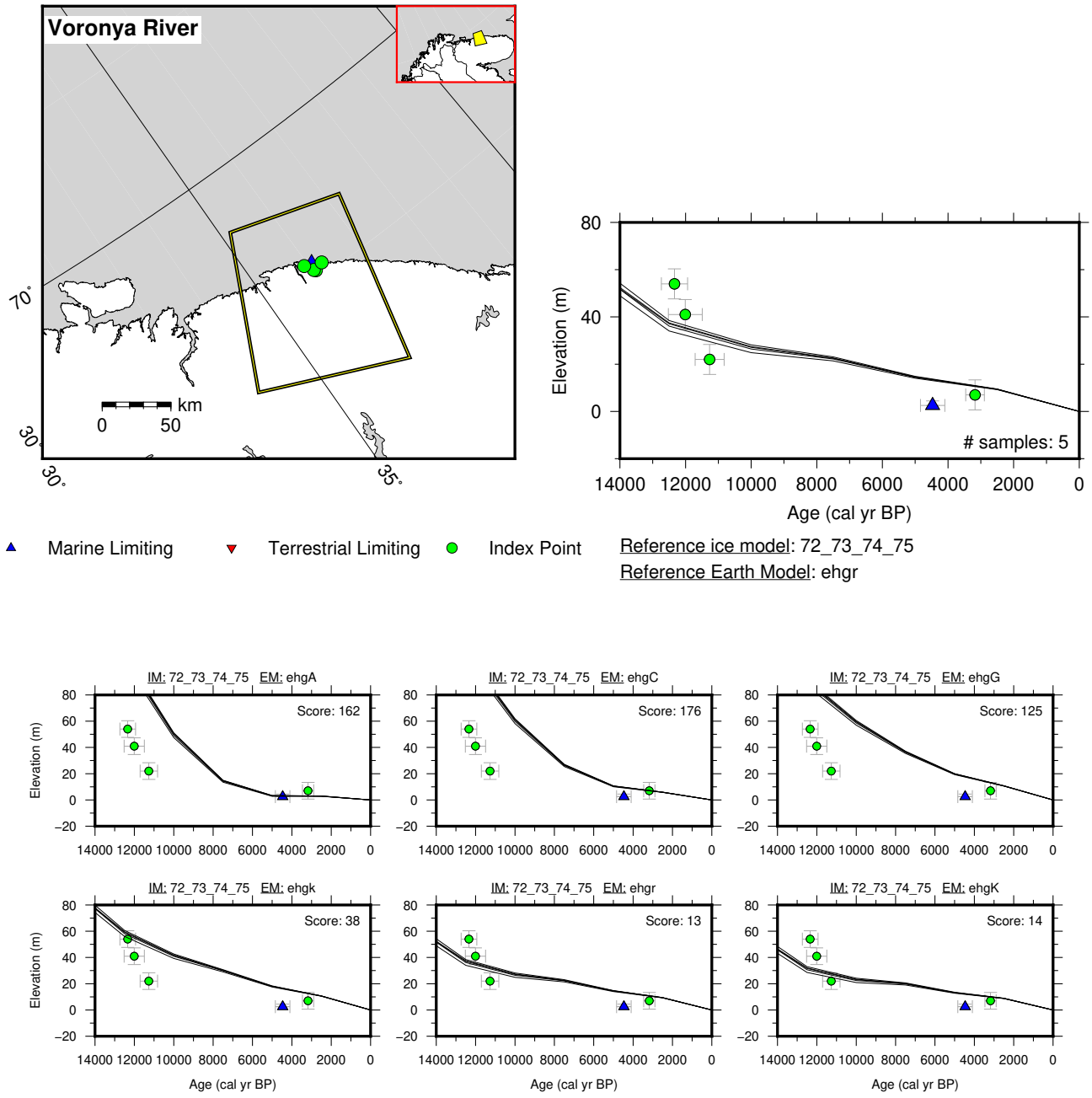


Figure 22: Paleo-sea level and comparison of six models for subregion Southern Barents Sea, location Voronya River.

7.4 Svalbard

References for the data used in each location.

Bockfjorden: Salvigsen and Høgvard (2006)

Broggerhalvoya: Forman et al. (1987, 2004)

Ytterdalen: Landvik et al. (1987)

Sorkapp Land: Salvigsen and Elgersma (1993)

Agardbukta: Salvigsen and Mangerud (1991)

Southern Edgeoya: Bondevik et al. (1995)

Diskobukta: Bondevik et al. (1995)

Humla: Bondevik et al. (1995)

Kapp Ziehen: Bondevik et al. (1995)

Svartknausflya: Salvigsen (1978)

Kongsoya: Salvigsen (1981)

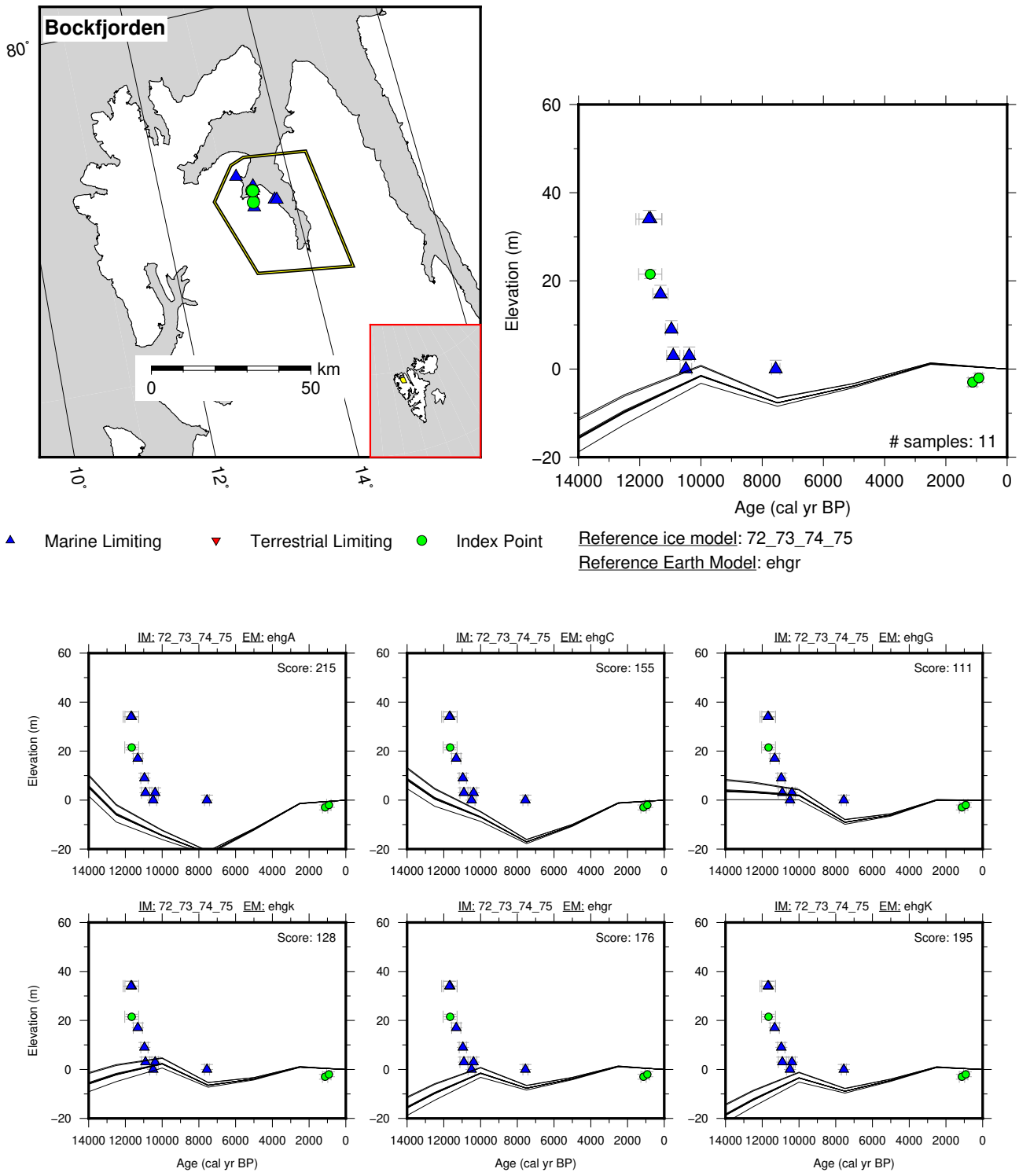


Figure 23: Paleo-sea level and comparison of six models for subregion Svalbard, location Bockfjorden.

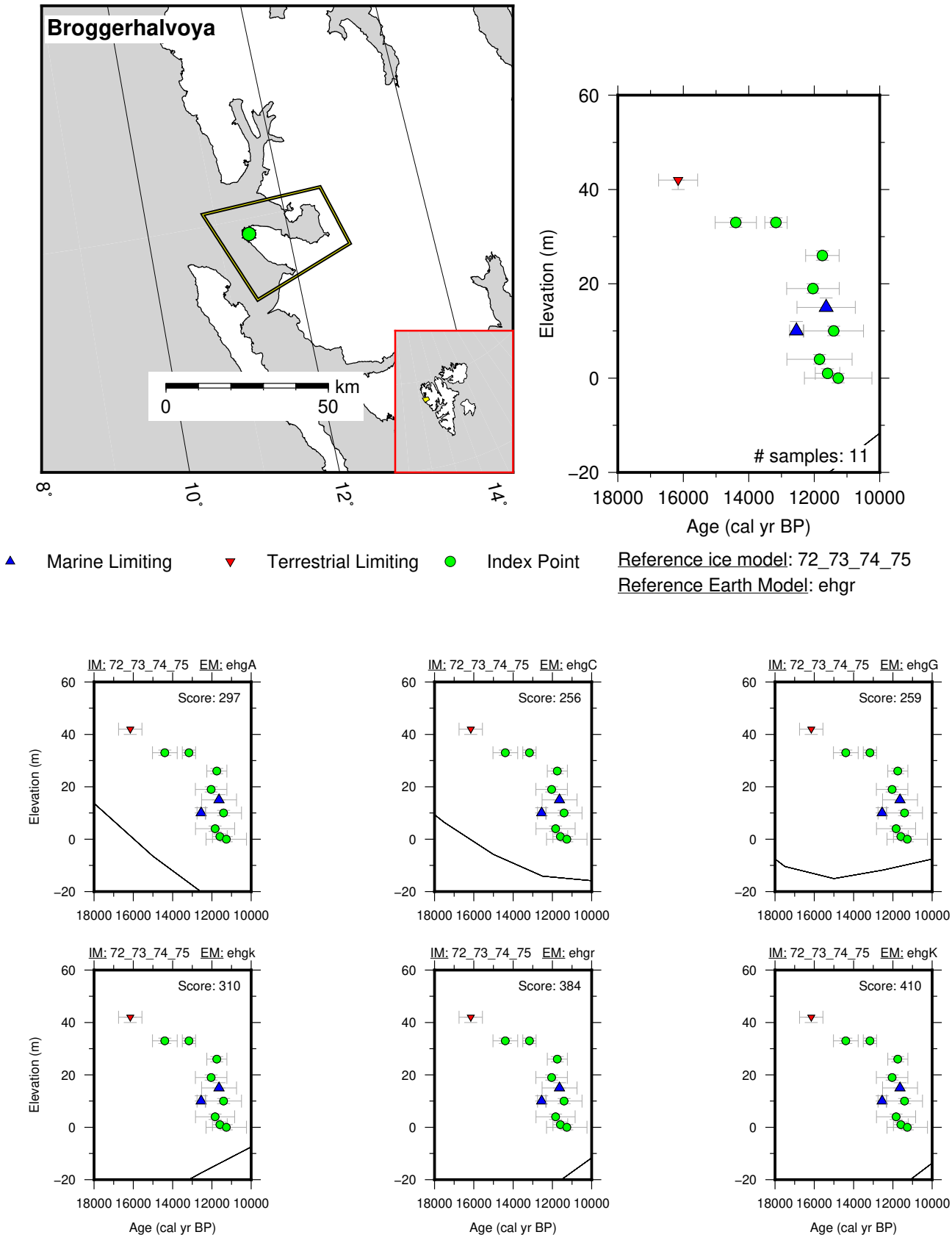


Figure 24: Paleo-sea level and comparison of six models for subregion Svalbard, location Broggerhalvoya.

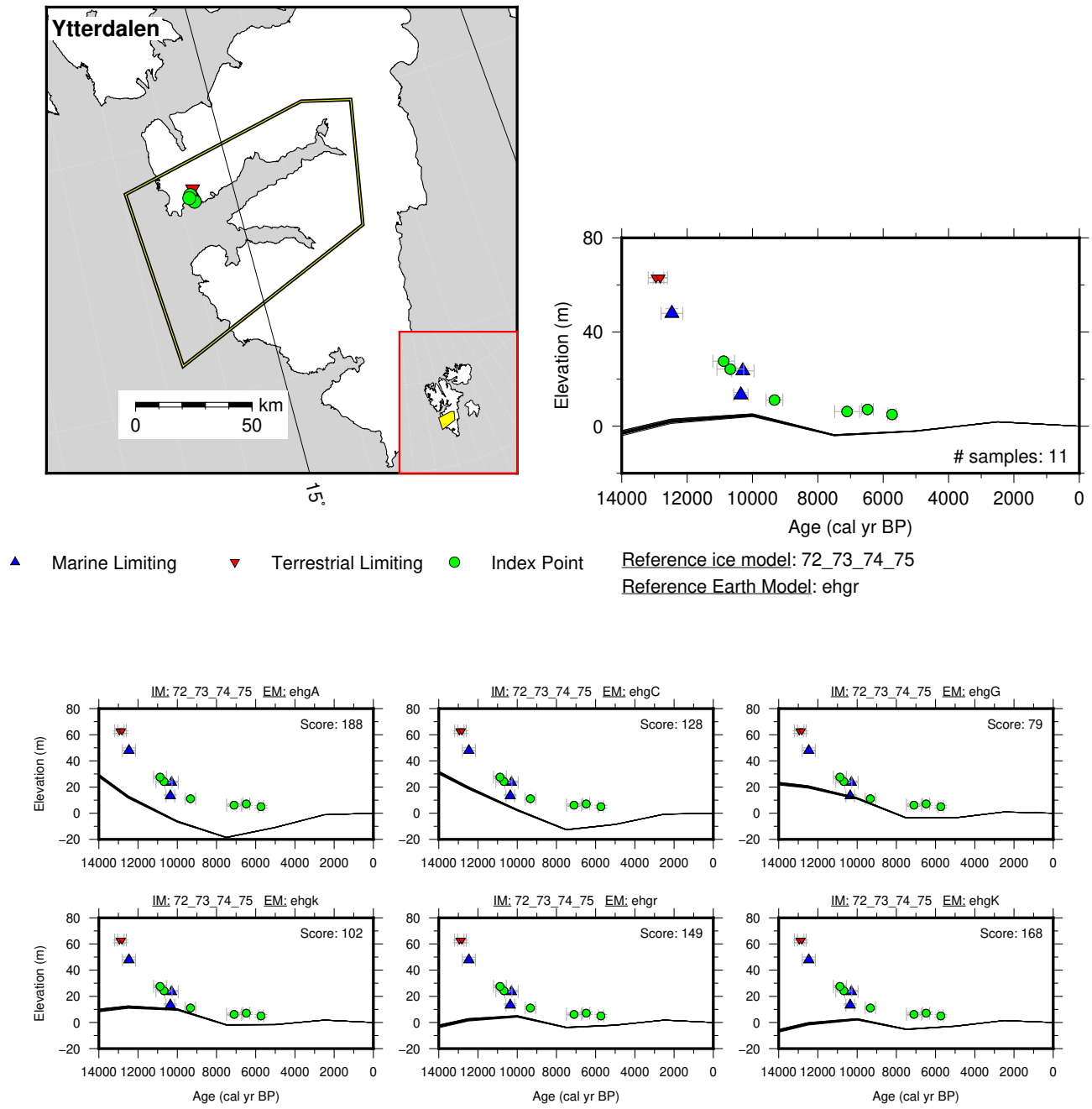


Figure 25: Paleo-sea level and comparison of six models for subregion Svalbard, location Ytterdalen.

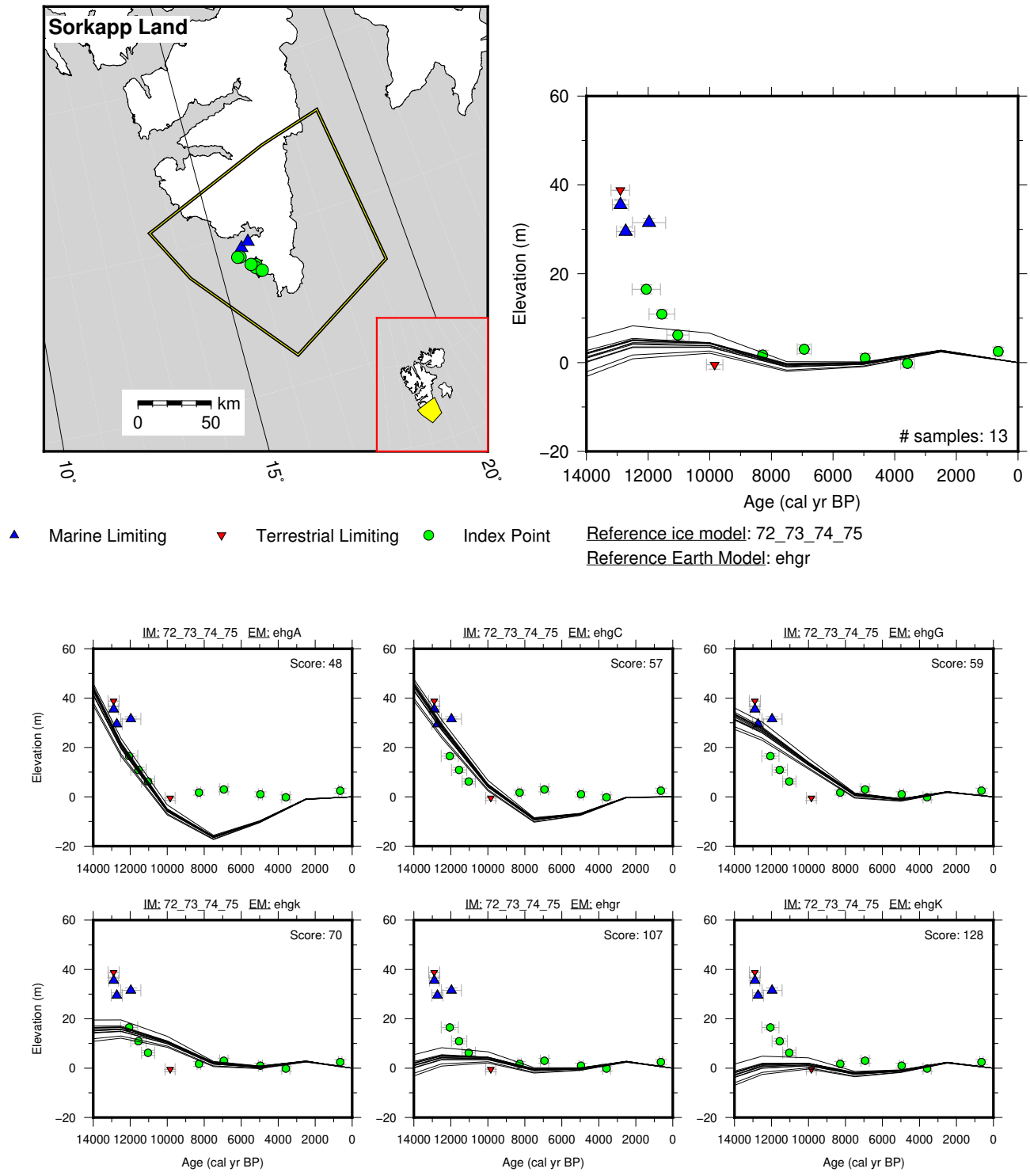
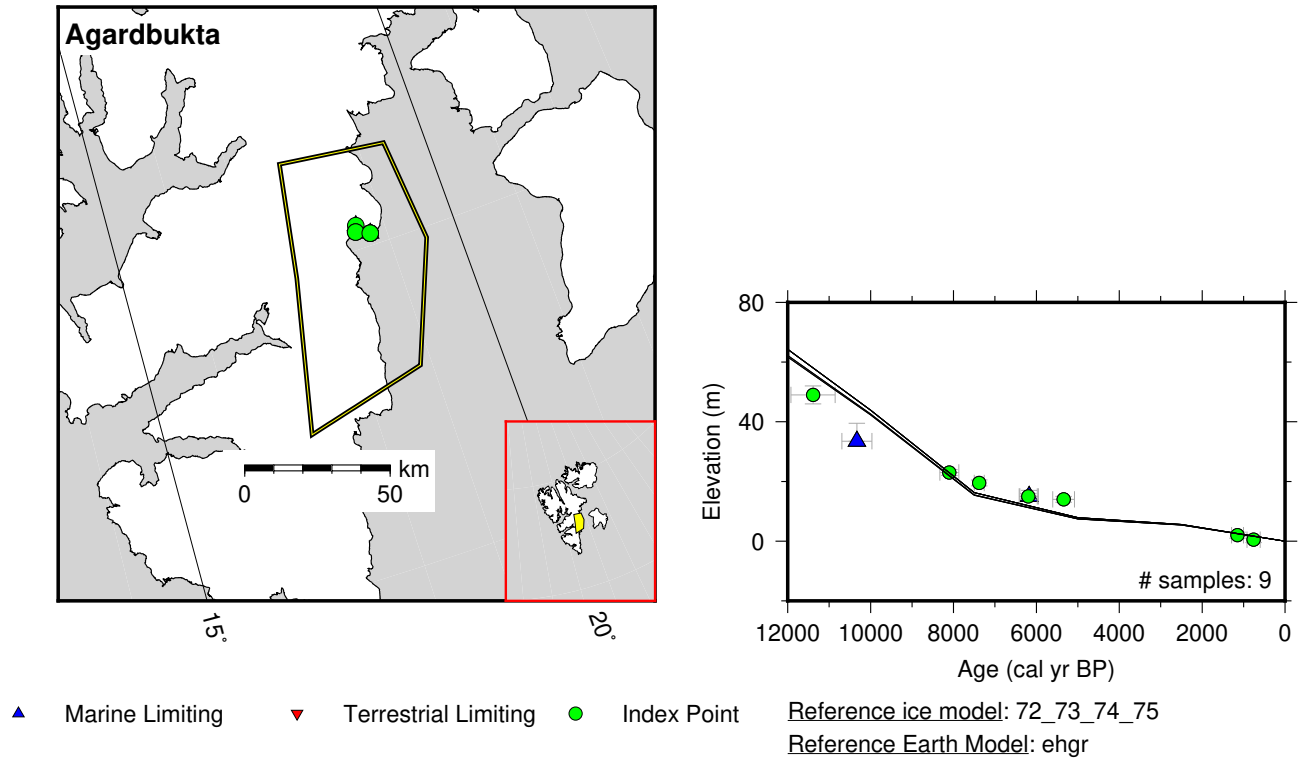


Figure 26: Paleo-sea level and comparison of six models for subregion Svalbard, location Sorkapp Land.



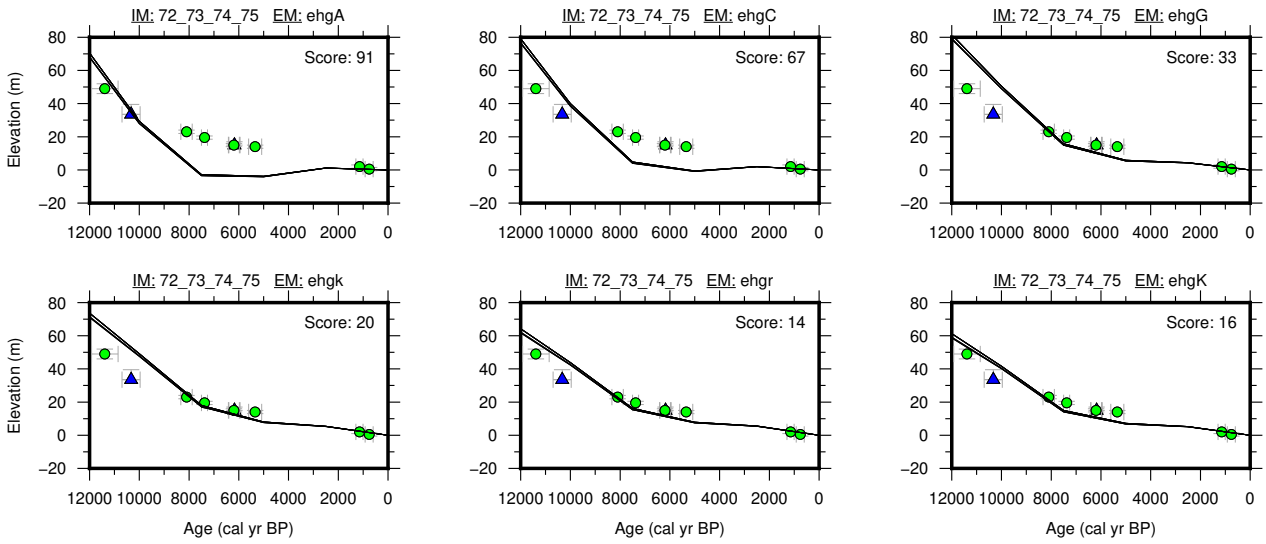


Figure 27: Paleo-sea level and comparison of six models for subregion Svalbard, location Agardbukta.

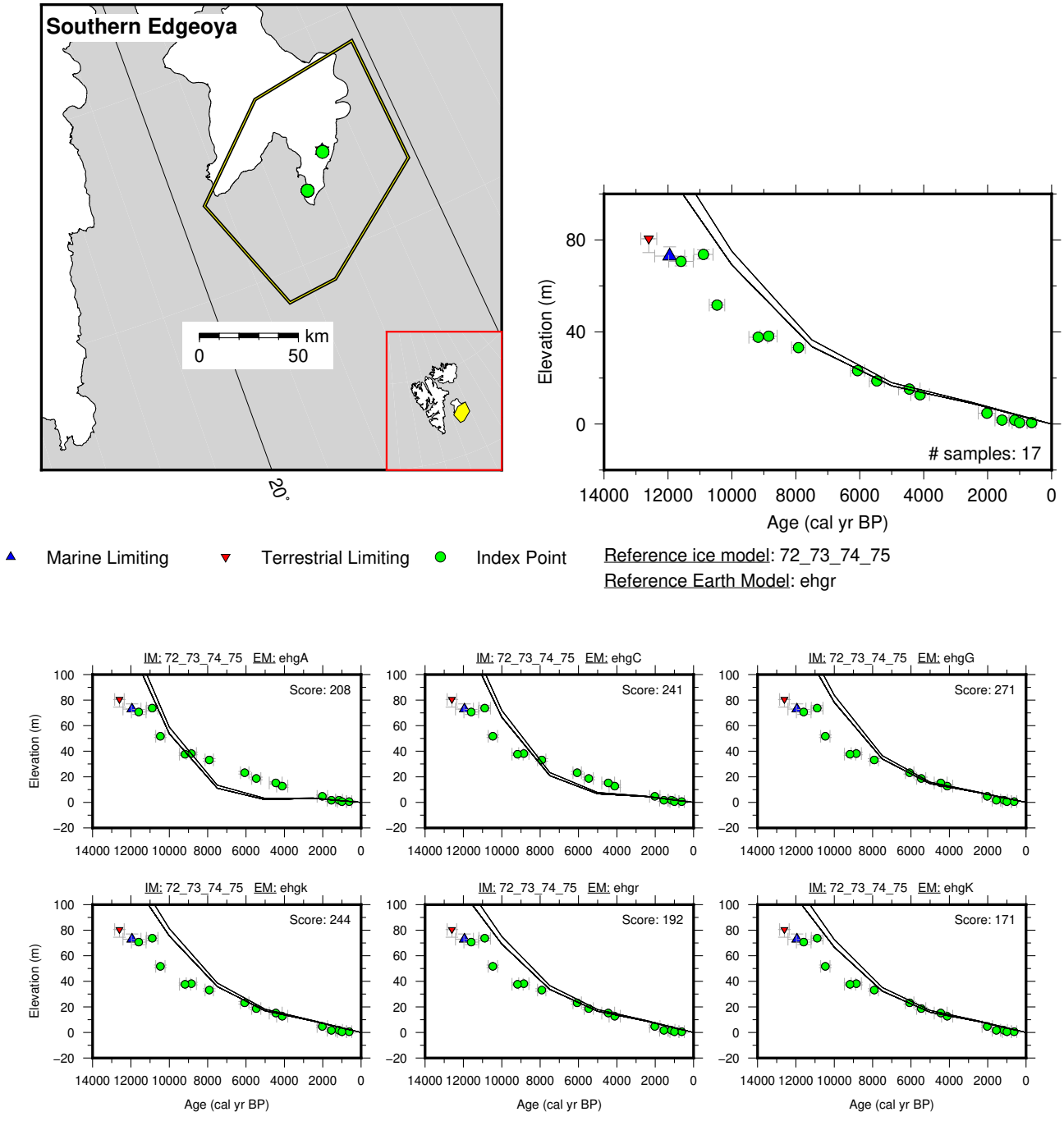


Figure 28: Paleo-sea level and comparison of six models for subregion Svalbard, location Southern Edgeoya.

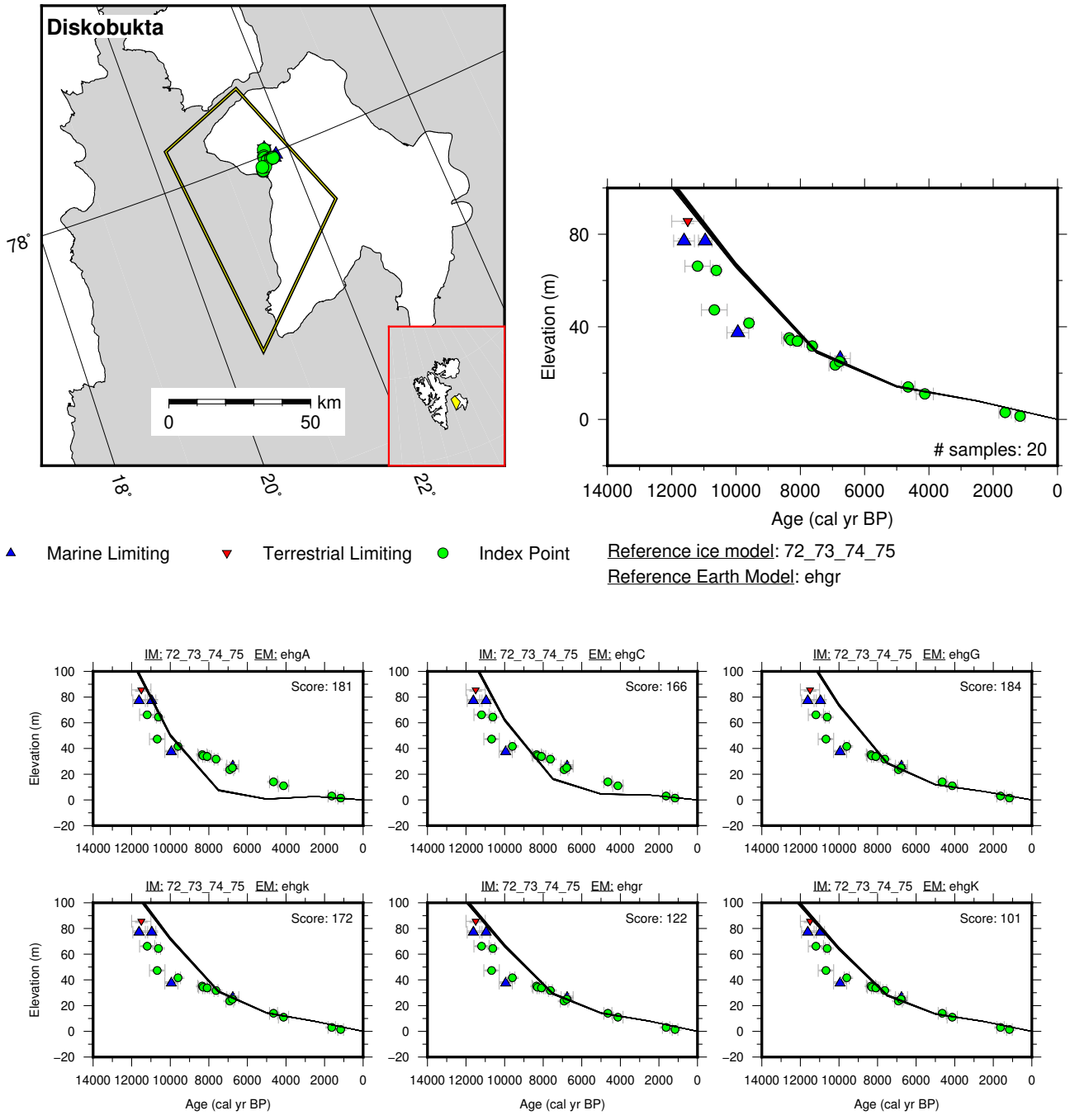


Figure 29: Paleo-sea level and comparison of six models for subregion Svalbard, location Diskobukta.

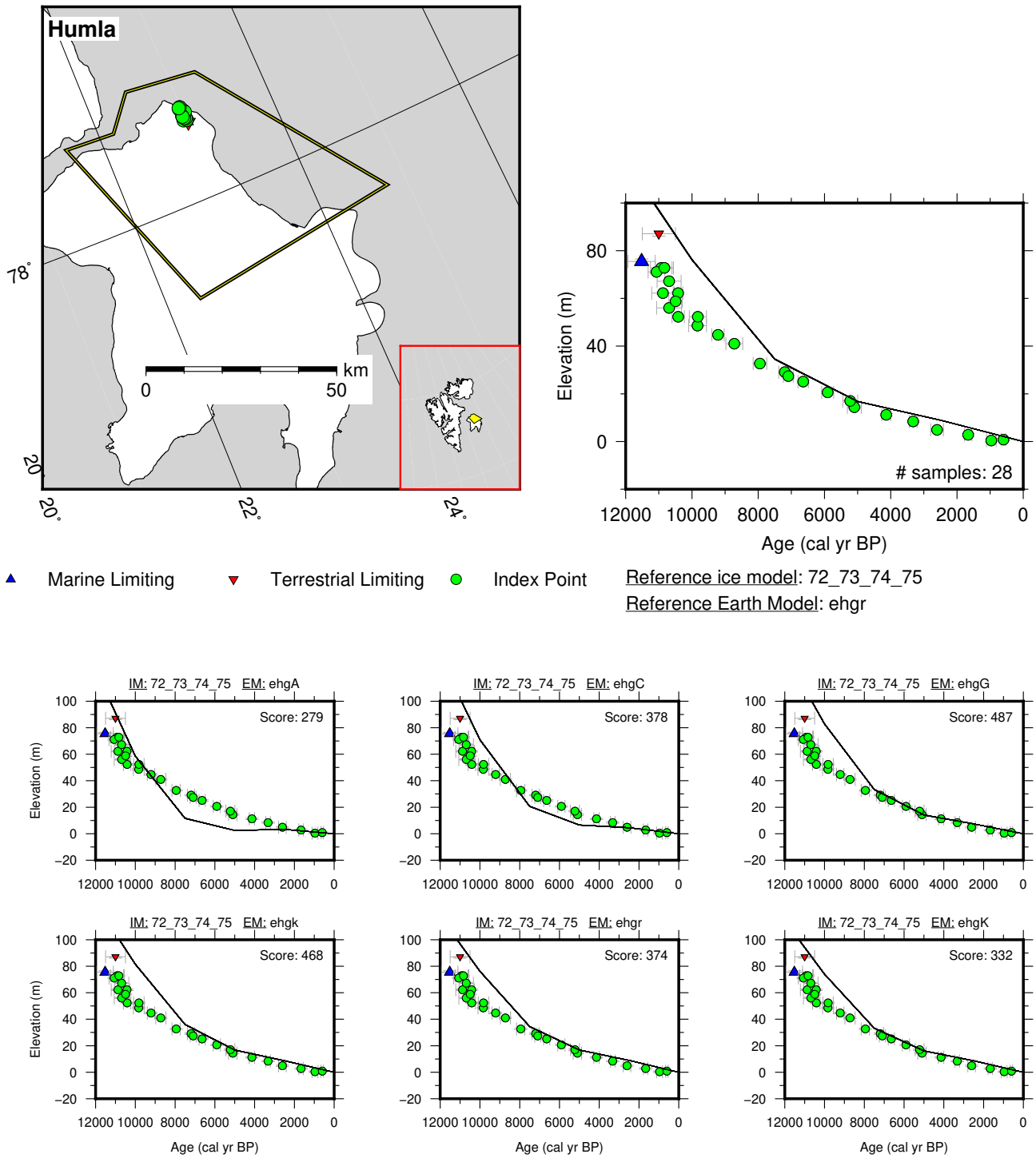


Figure 30: Paleo-sea level and comparison of six models for subregion Svalbard, location Humla.

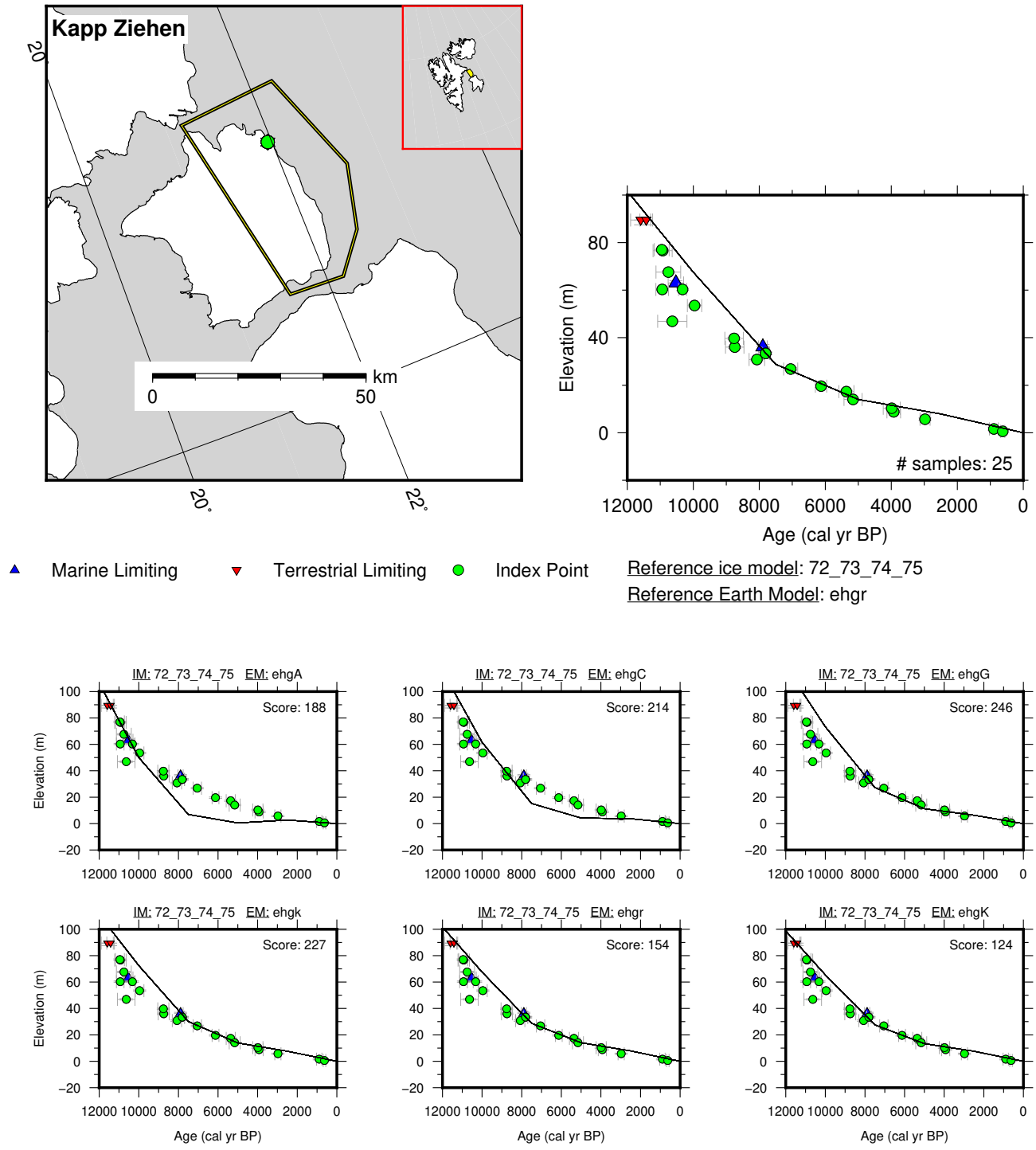


Figure 31: Paleo-sea level and comparison of six models for subregion Svalbard, location Kapp Ziehen.

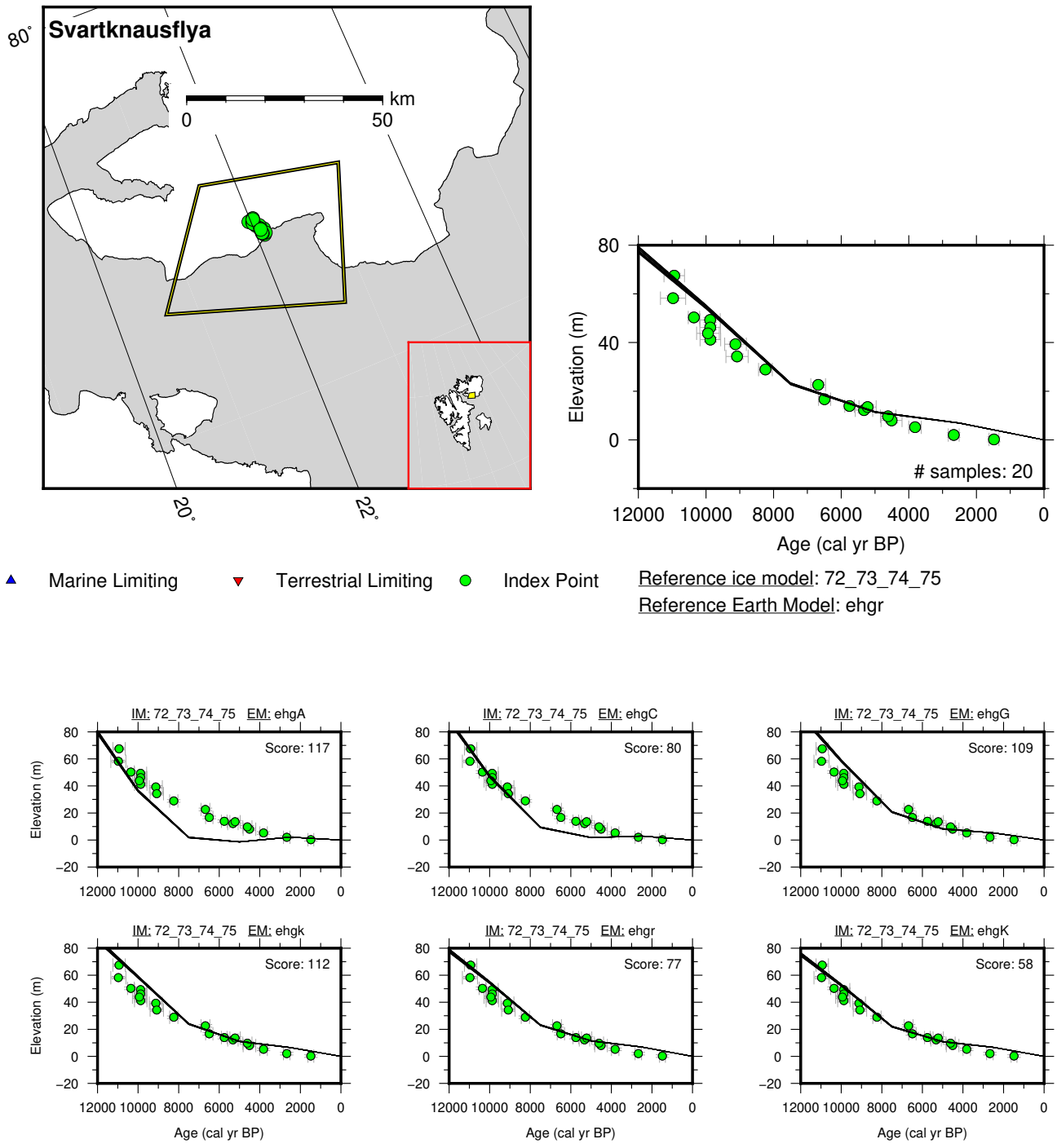


Figure 32: Paleo-sea level and comparison of six models for subregion Svalbard, location Svartknausflya.

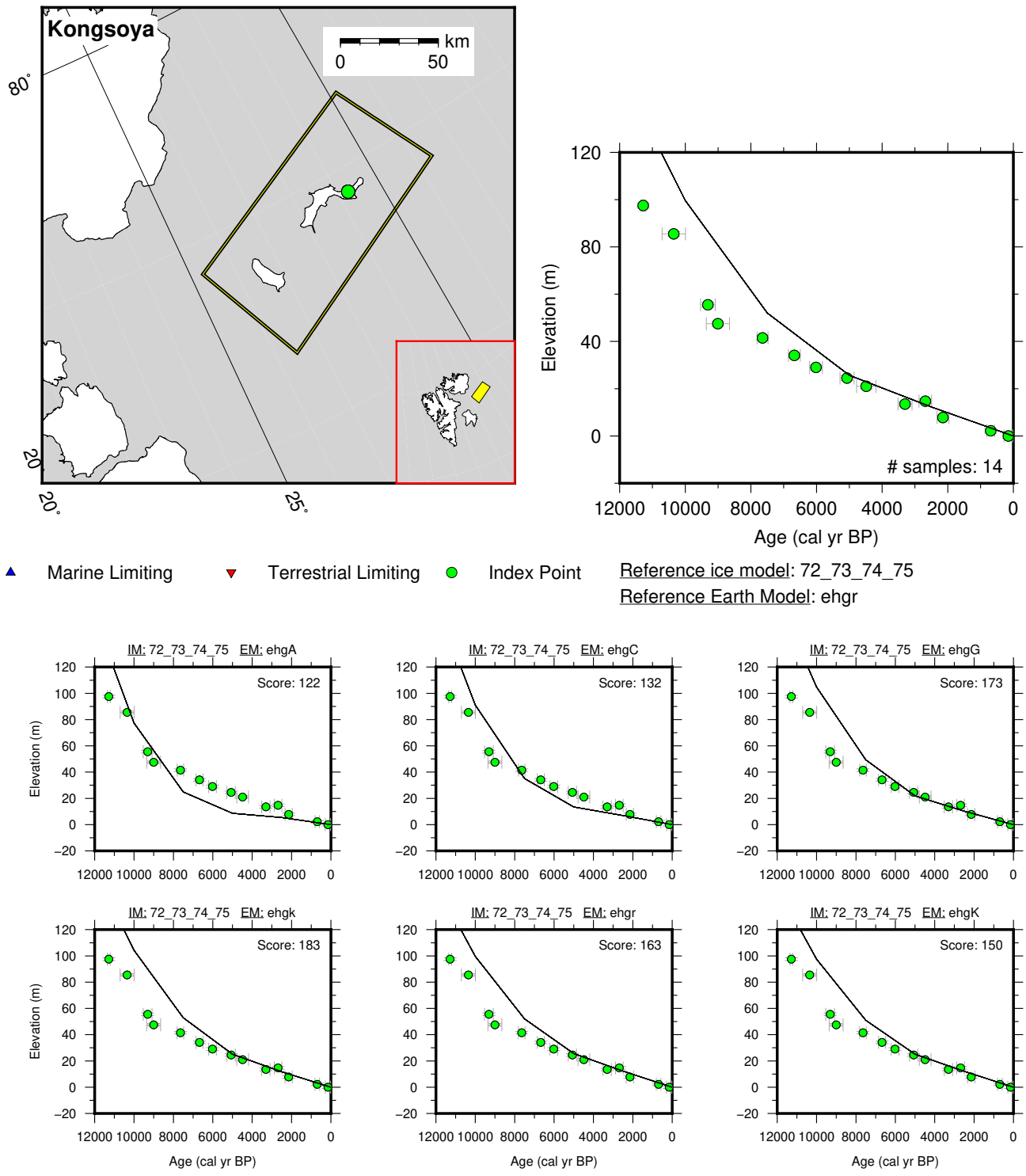


Figure 33: Paleo-sea level and comparison of six models for subregion Svalbard, location Kongsoya.

7.5 Western Siberia

References for the data used in each location.

Severnaya Zemlya: Bolshiyanov and Makeev (1995); Raab et al. (2003)

West Laptev Sea: Bauch et al. (1999); Bolshiyanov et al. (2013); Winterfeld et al. (2011)

Olenyok Gulf: Andreev et al. (2004); Bolshiyanov et al. (2013); Makarov (2009)

Lena Delta: Makarov (2009)

New Siberian Islands: Anisimov et al. (2009a); Bolshiyanov et al. (2013); Polyakova et al. (2005)

Zhokhov Island: Anisimov et al. (2009b)

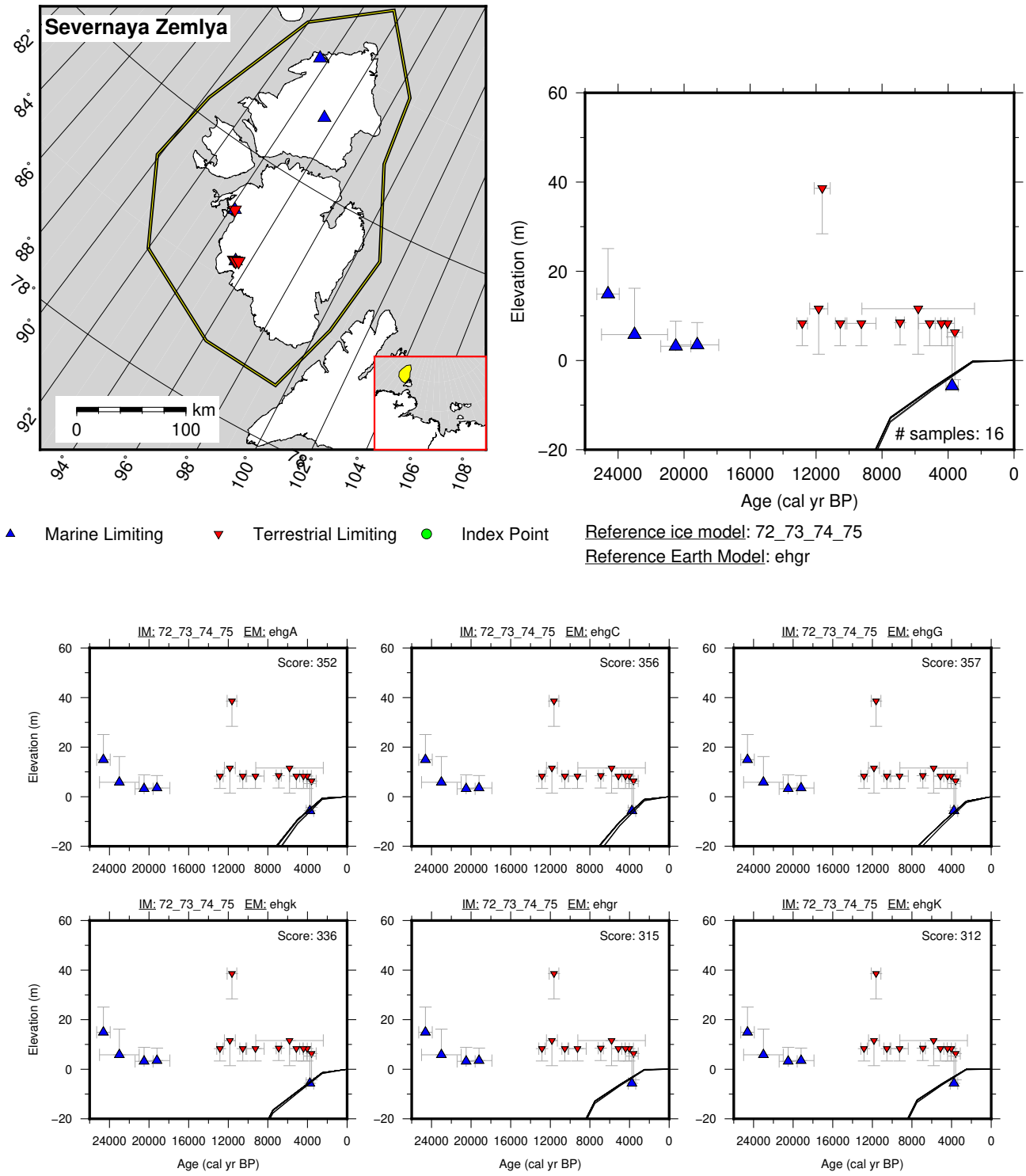


Figure 34: Paleo-sea level and comparison of six models for subregion Western Siberia, location Severnaya Zemlya.

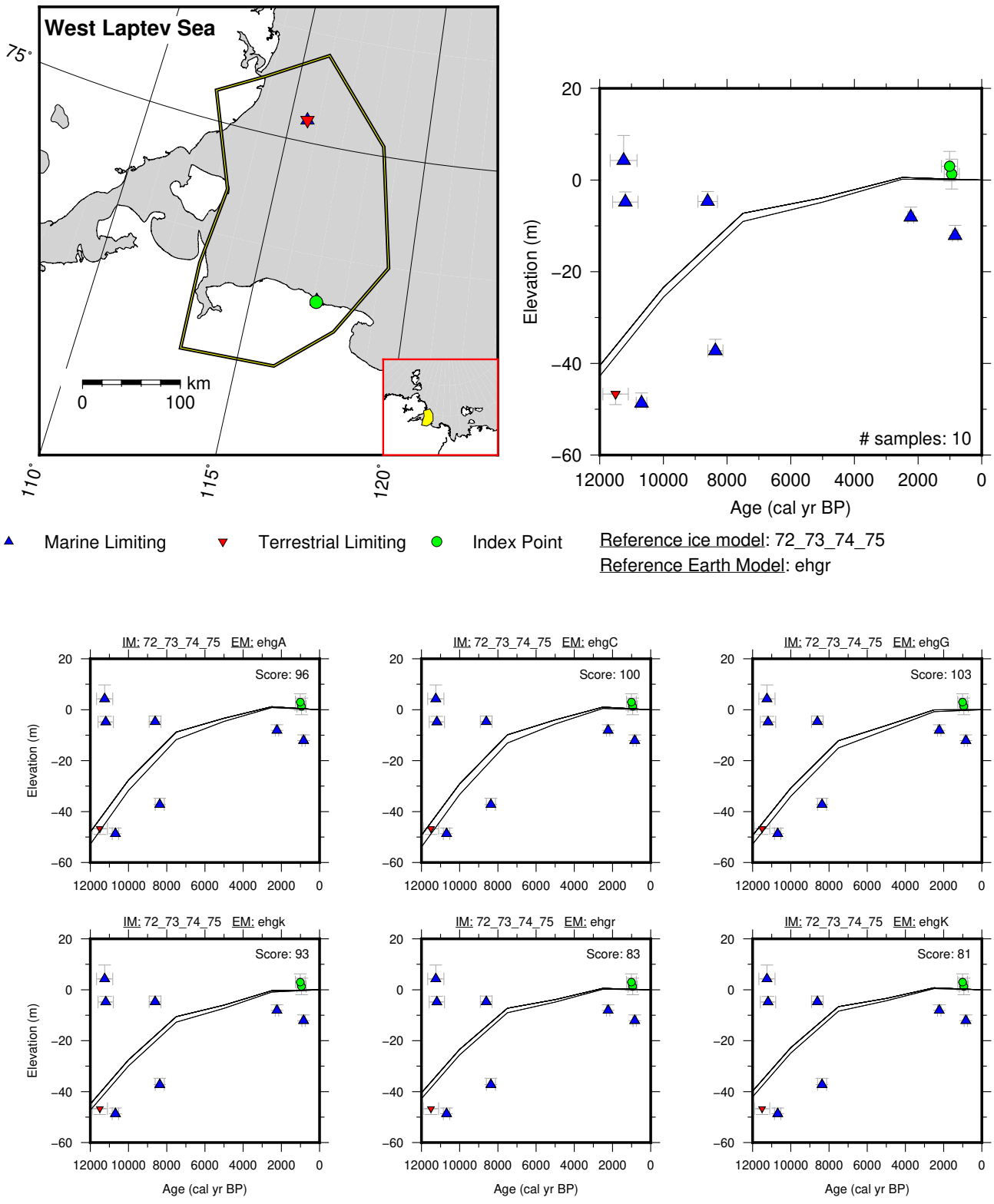
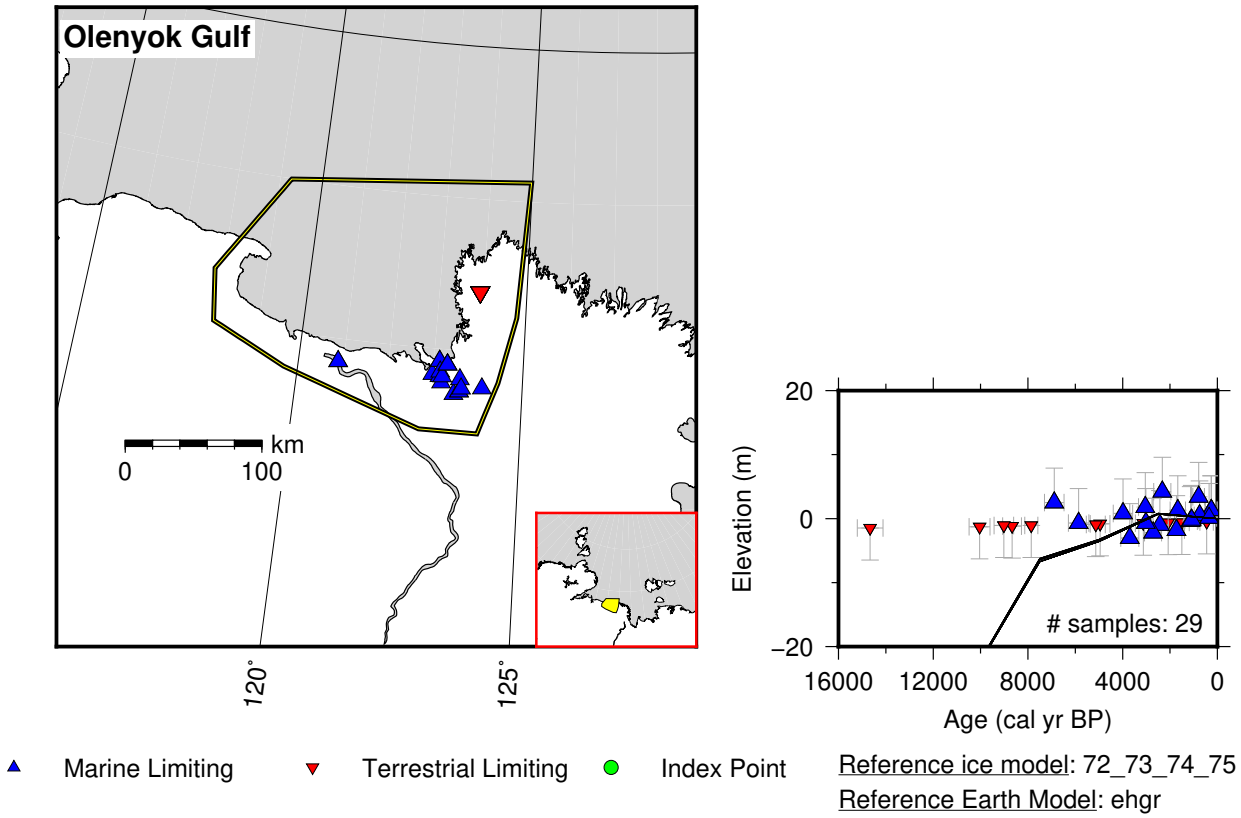


Figure 35: Paleo-sea level and comparison of six models for subregion Western Siberia, location West Laptev Sea.



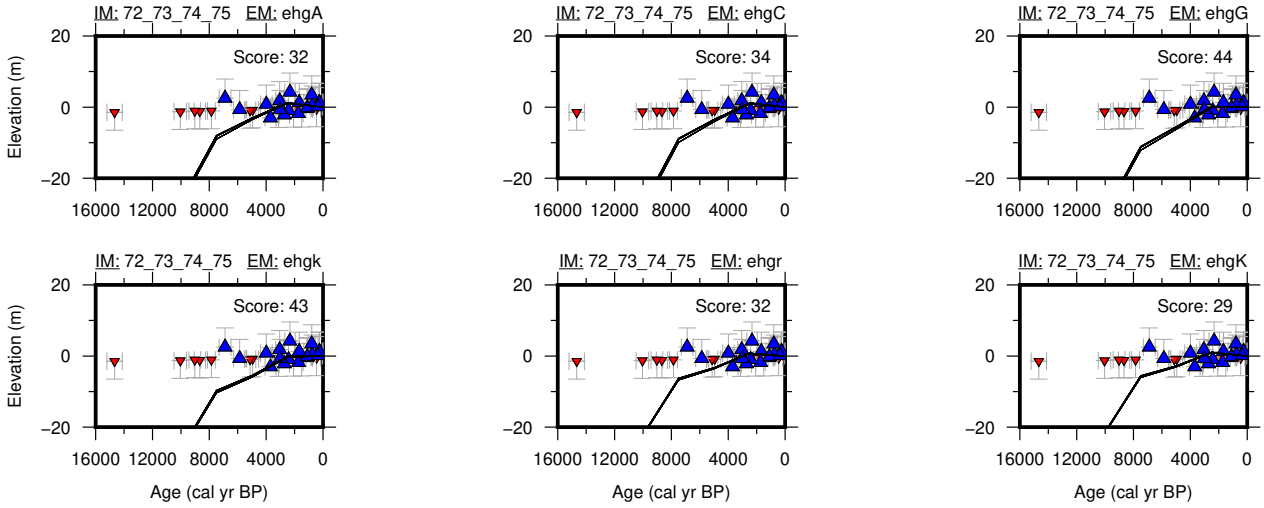


Figure 36: Paleo-sea level and comparison of six models for subregion Western Siberia, location Olenyok Gulf.

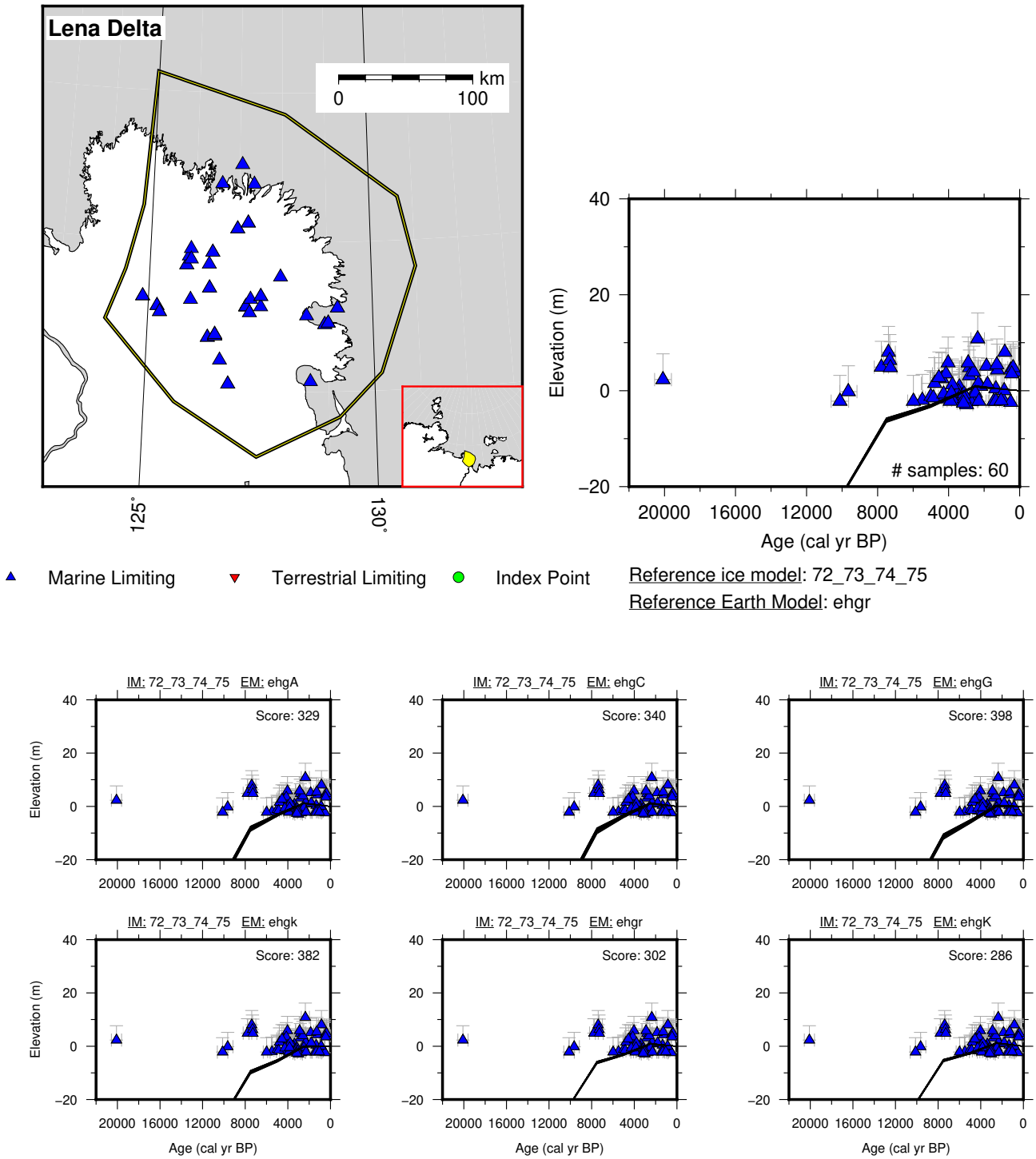


Figure 37: Paleo-sea level and comparison of six models for subregion Western Siberia, location Lena Delta.

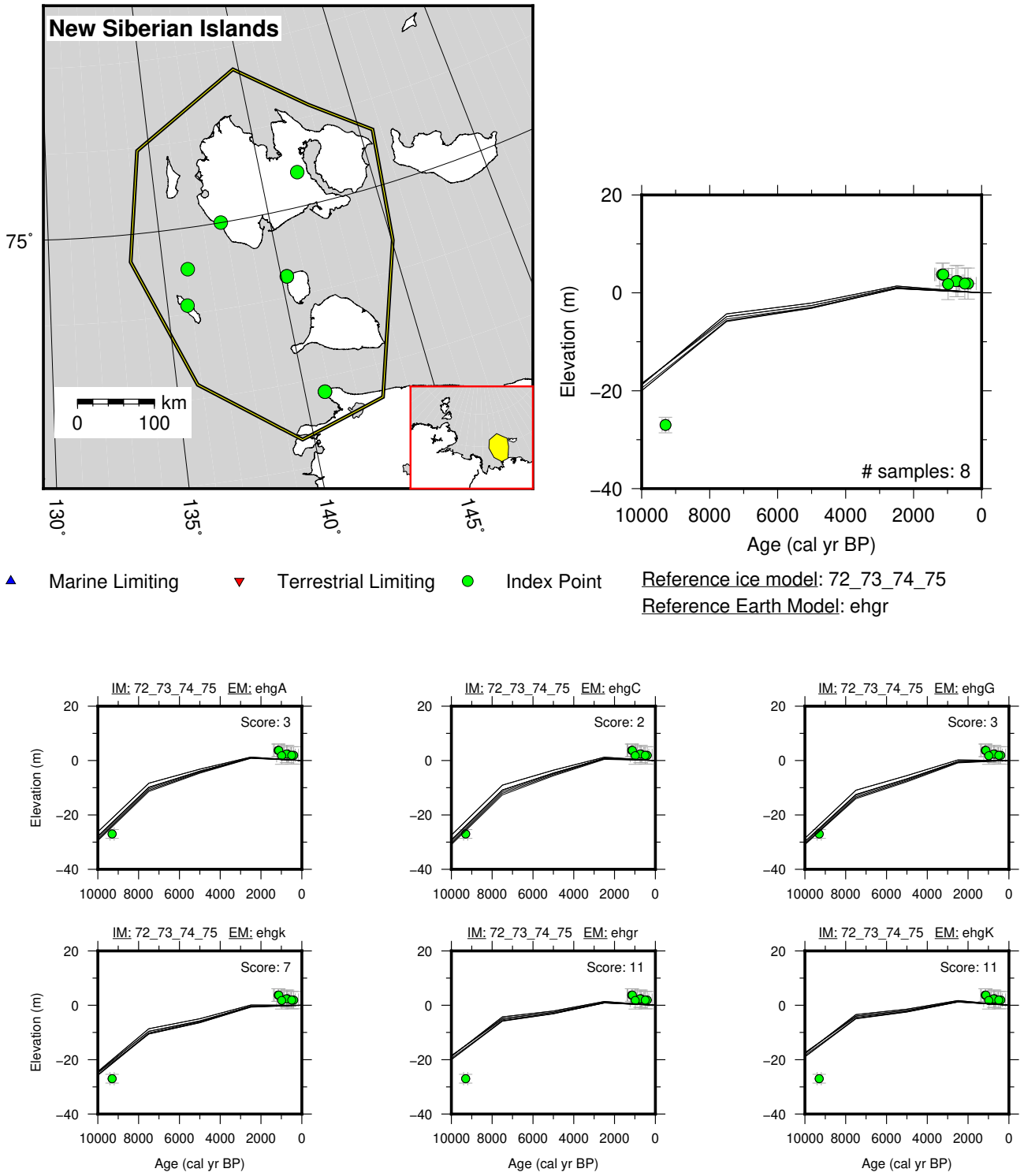


Figure 38: Paleo-sea level and comparison of six models for subregion Western Siberia, location New Siberian Islands.

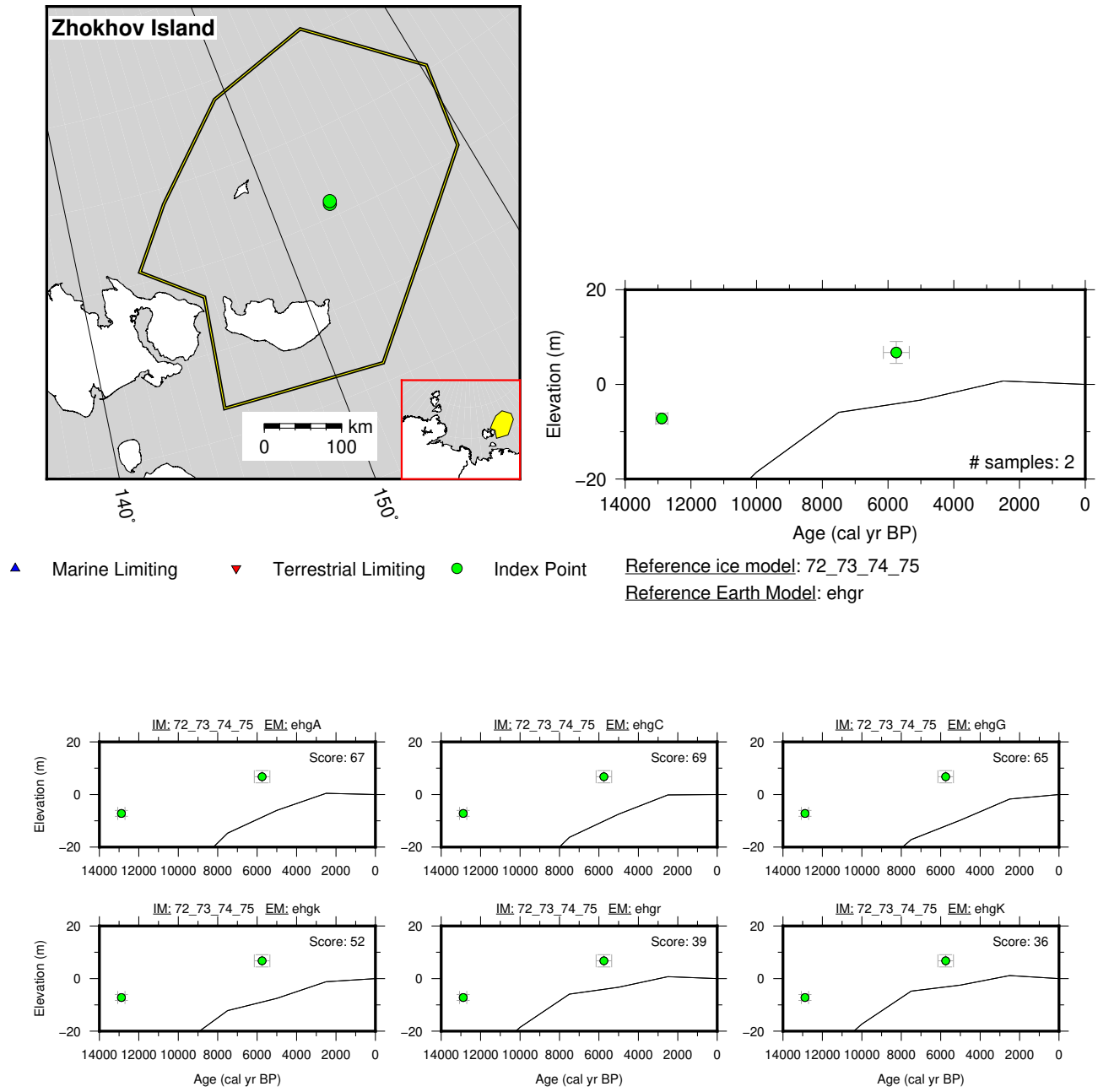


Figure 39: Paleo-sea level and comparison of six models for subregion Western Siberia, location Zhokhov Island.

7.6 White Sea

References for the data used in each location.

Kandalaksha: Arslanov et al. (1974); Kolka and Korsakova (2010); Koshechkin (1979)

Lesozavodskiy: Arslanov et al. (1974); Kolka et al. (2005); Koshechkin et al. (1973)

Rugozerskiy Peninsula: Baranskaya (2015); Repkina and Romanenko (2016); Romanenko and Shilova (2012); Zaretskaya et al. (2013)

Chupa Bay: Baranskaya and Romanenko (2015); Kolka et al. (2015)

Umba: Arslanov et al. (1974); Kolka et al. (2013a); Koshechkin (1979)

Engozero: Kolka et al. (2013b)

Belomorsk: Devyatova and Liyva (1971); Koshechkin (1979); Lunkka et al. (2012)

Eastern Kola Peninsula: Arslanov et al. (1974); Koshechkin (1979)

Onega Peninsula: Boyarskaya et al. (1986); Koshechkin et al. (1973); Repkina et al. (in review)

Dvina Gulf: Koshechkin (1979); Zaretskaya et al. (2011)

Kholmogorsky: Larsen et al. (2006)

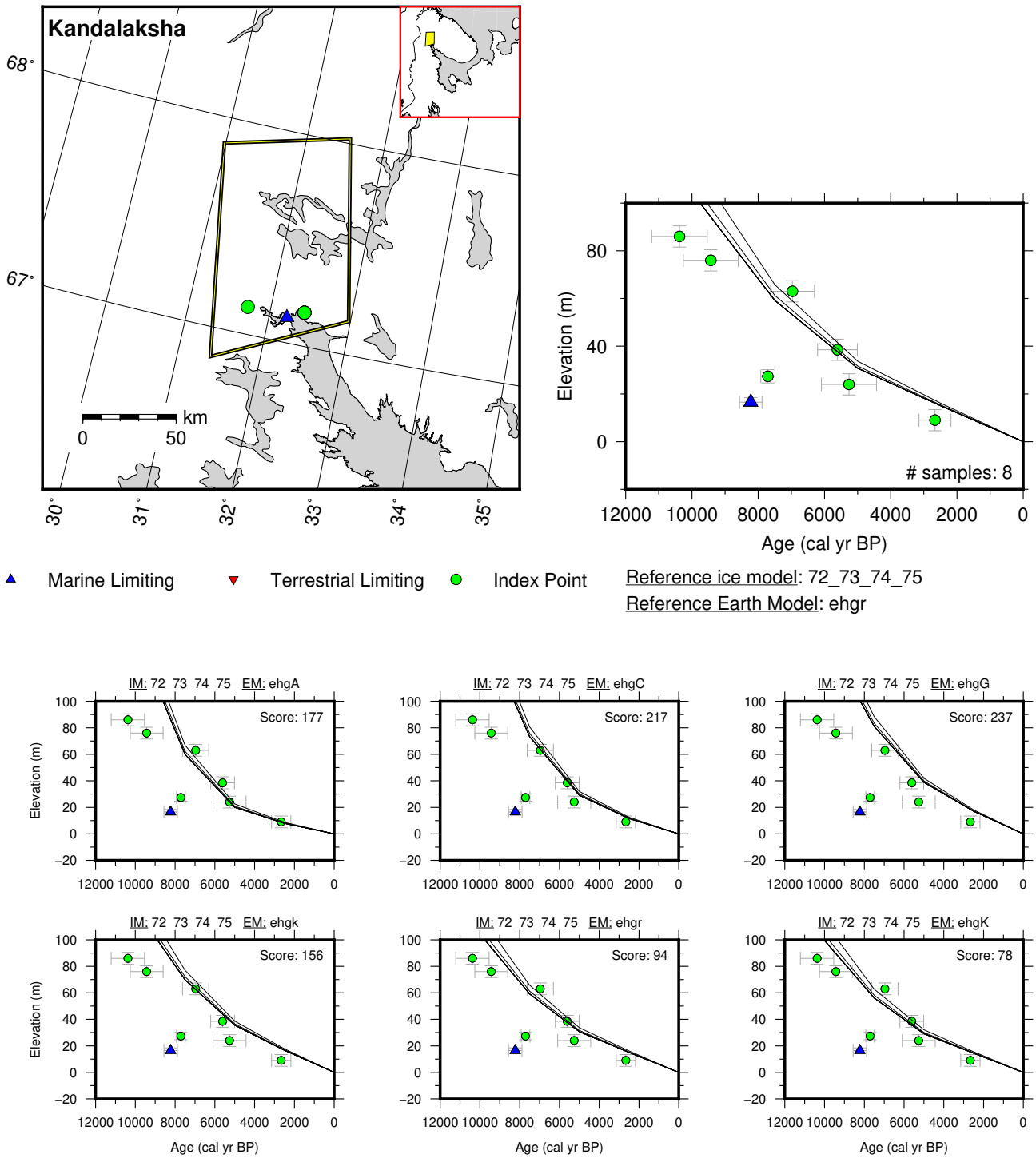


Figure 40: Paleo-sea level and comparison of six models for subregion White Sea, location Kandalaksha.

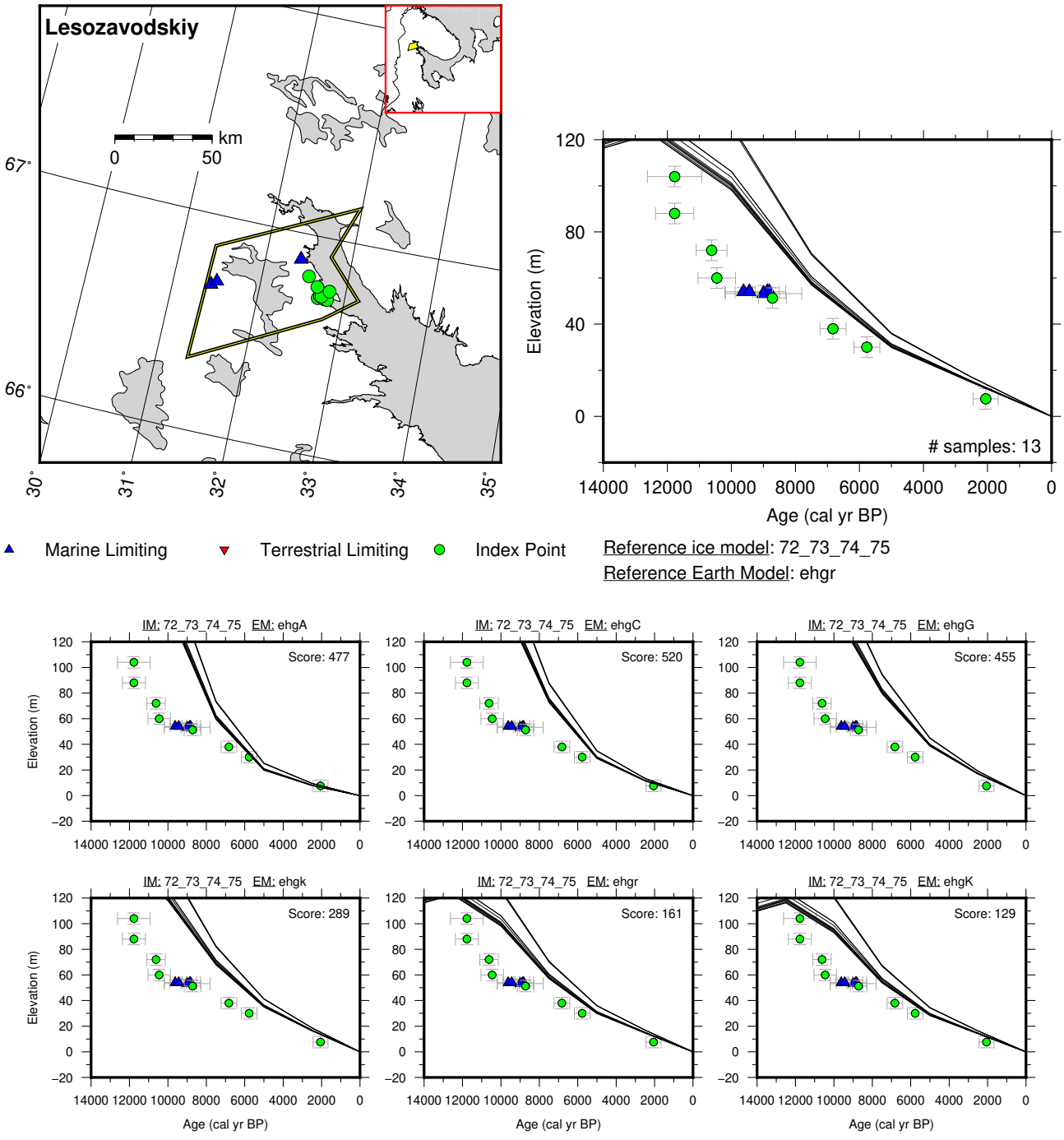


Figure 41: Paleo-sea level and comparison of six models for subregion White Sea, location Lesozavodskiy.

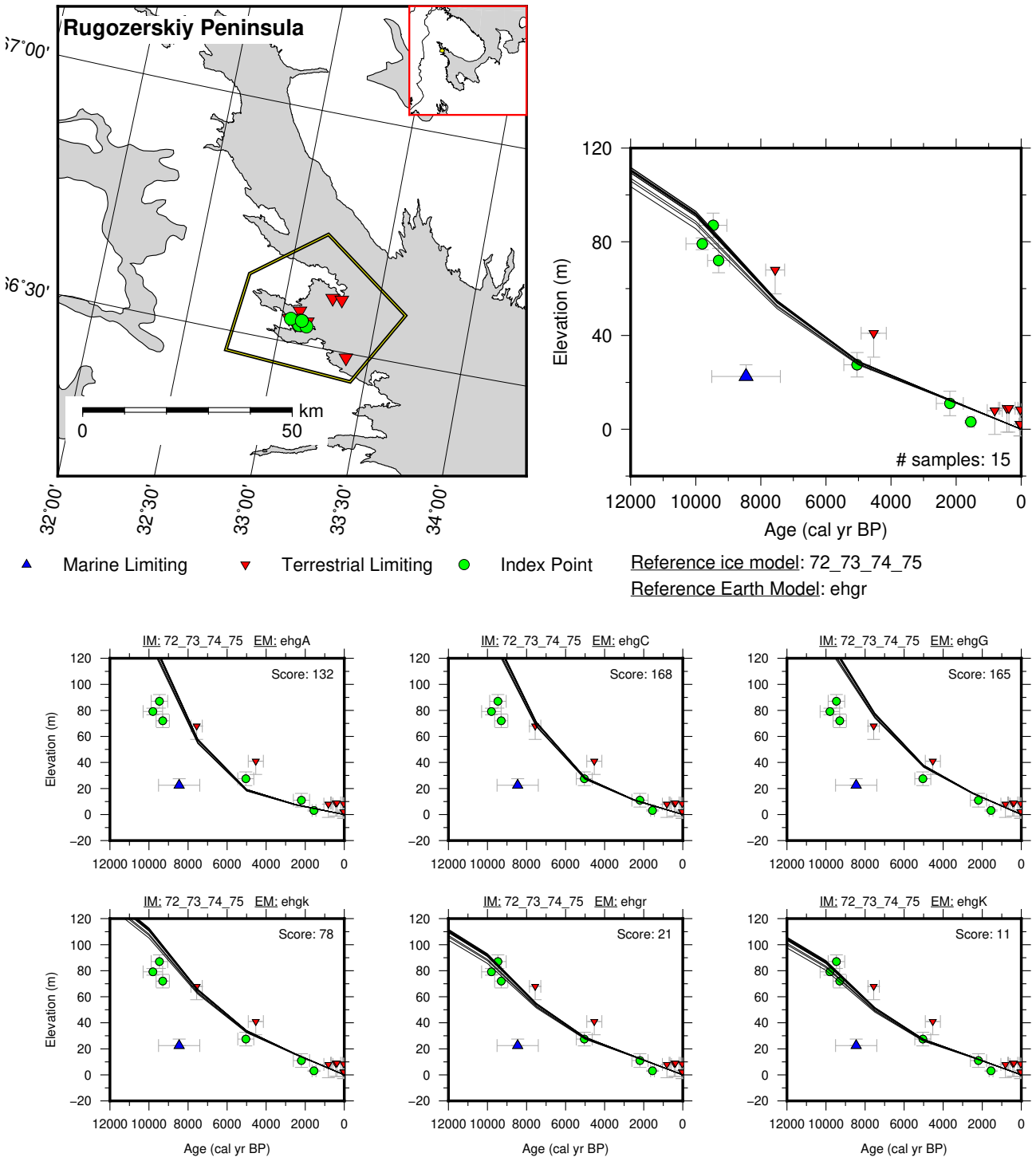


Figure 42: Paleo-sea level and comparison of six models for subregion White Sea, location Rugozerskiy Peninsula.

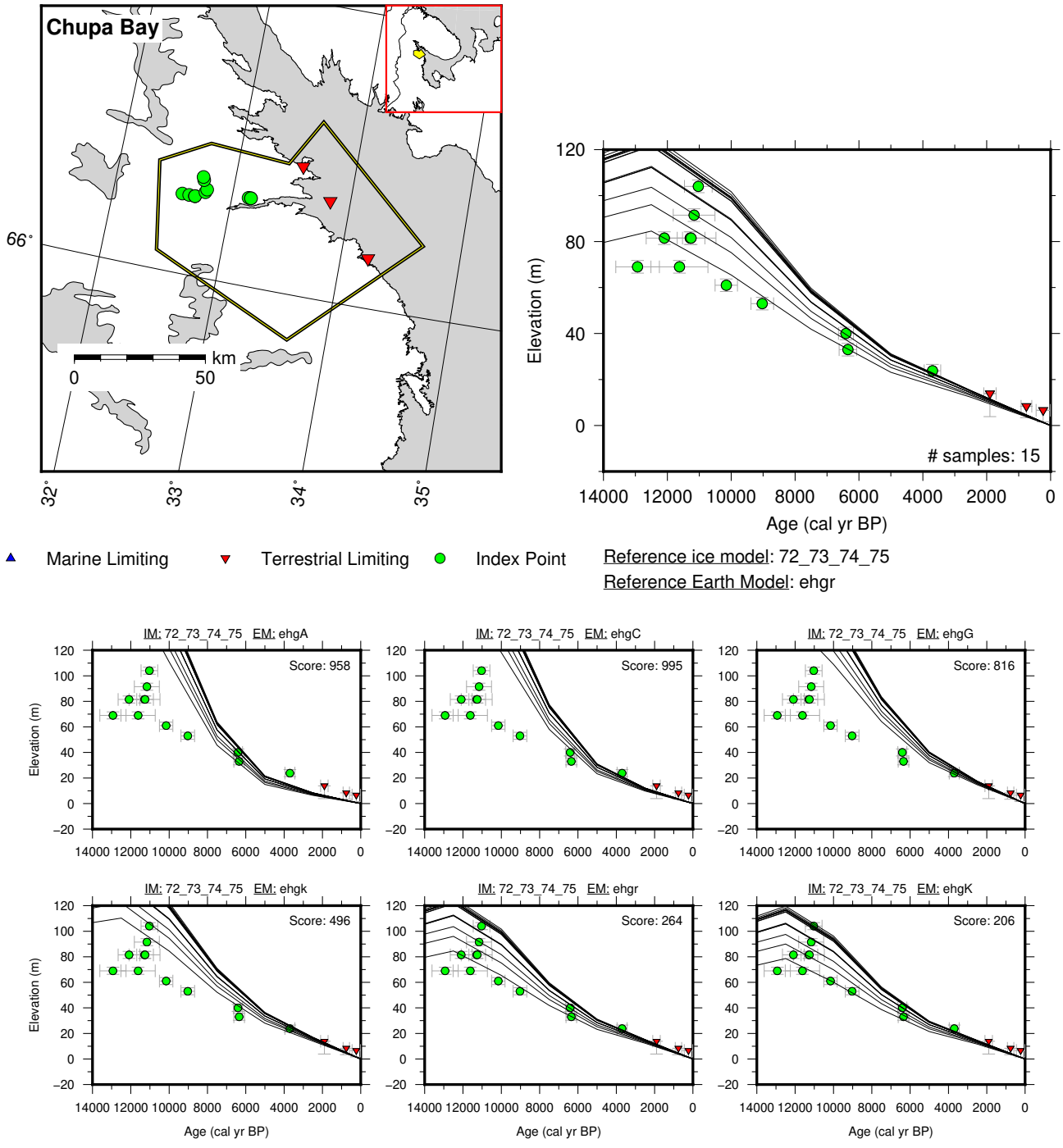


Figure 43: Paleo-sea level and comparison of six models for subregion White Sea, location Chupa Bay.

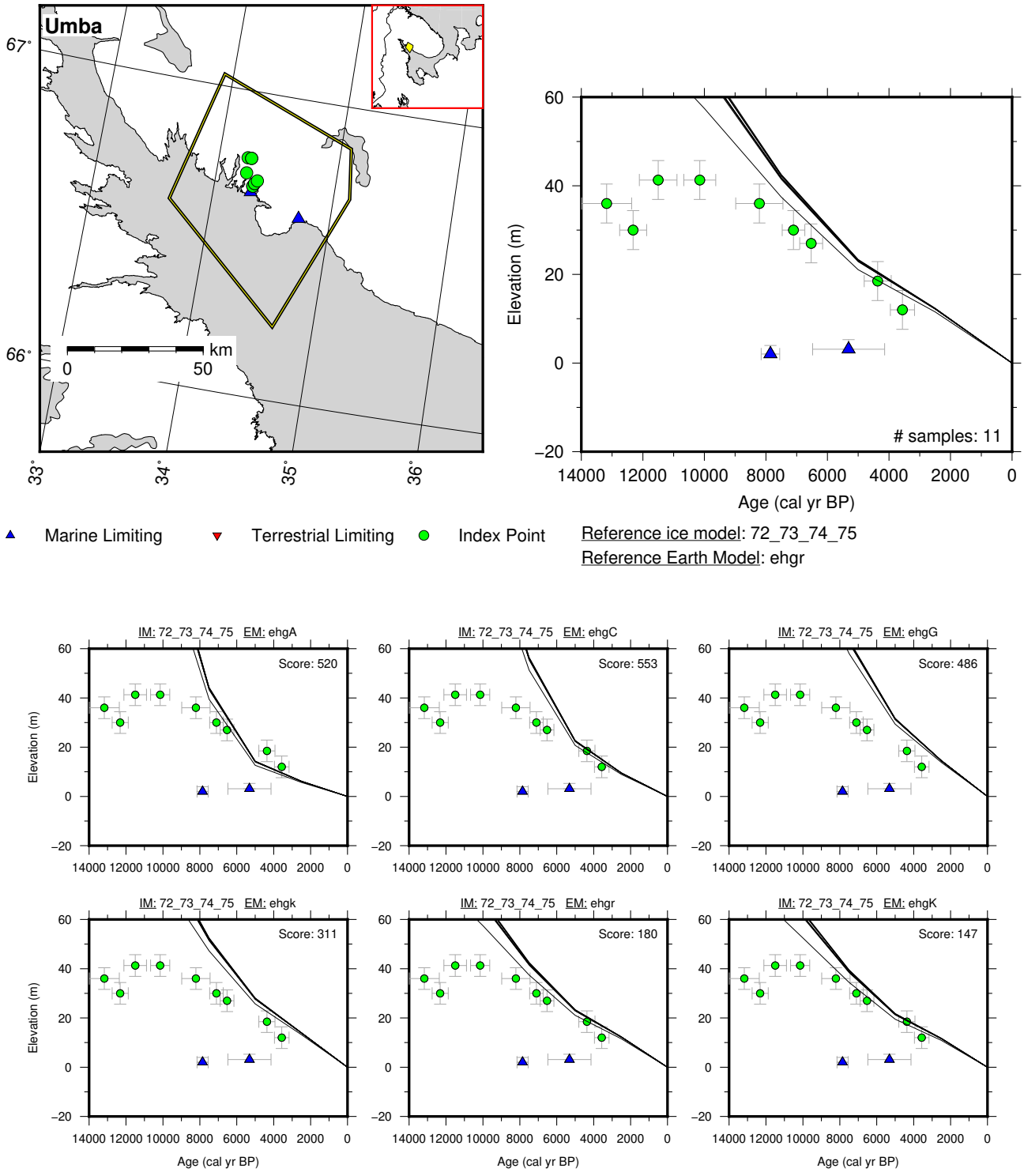


Figure 44: Paleo-sea level and comparison of six models for subregion White Sea, location Umba.

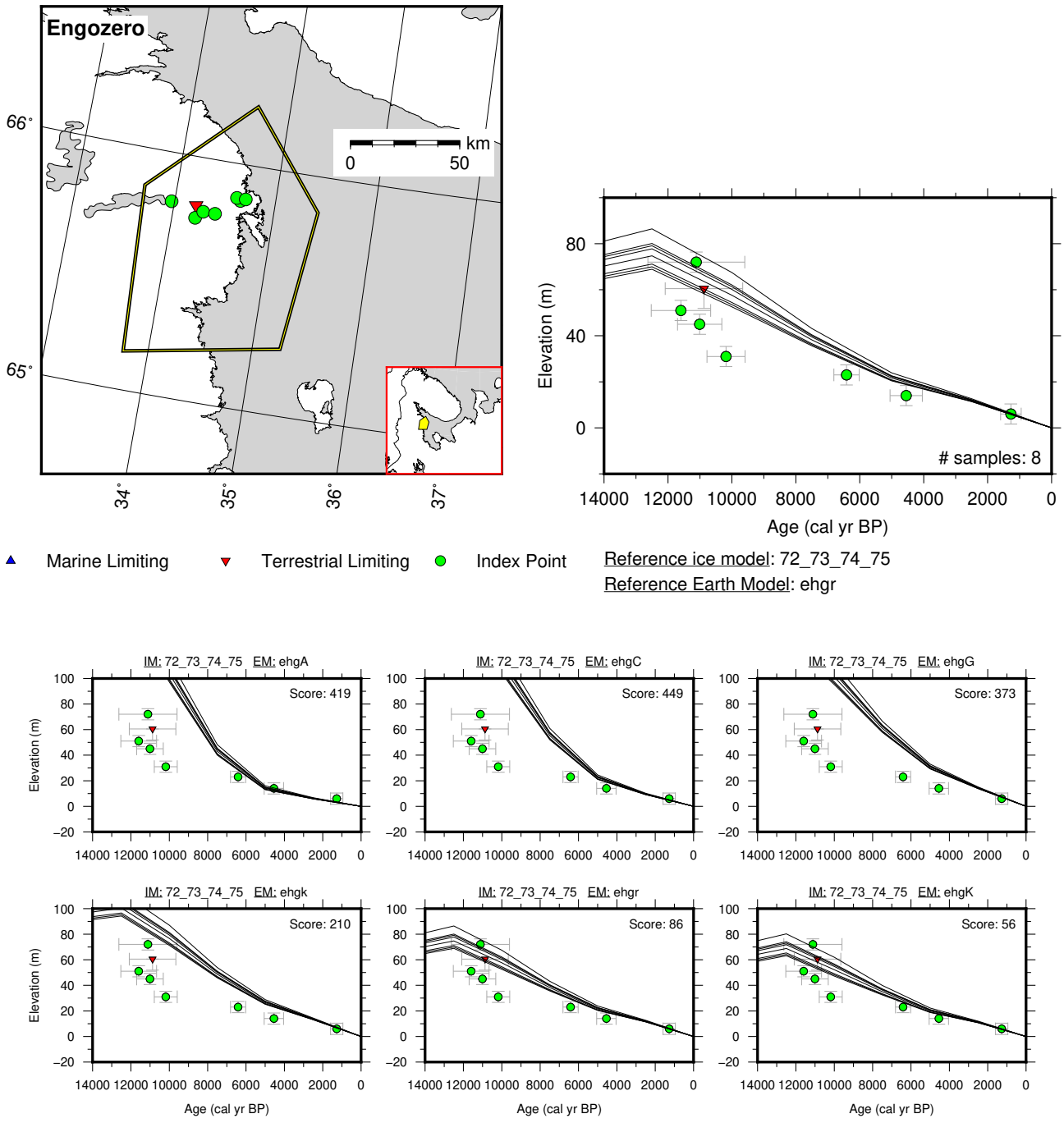


Figure 45: Paleo-sea level and comparison of six models for subregion White Sea, location Engozero.

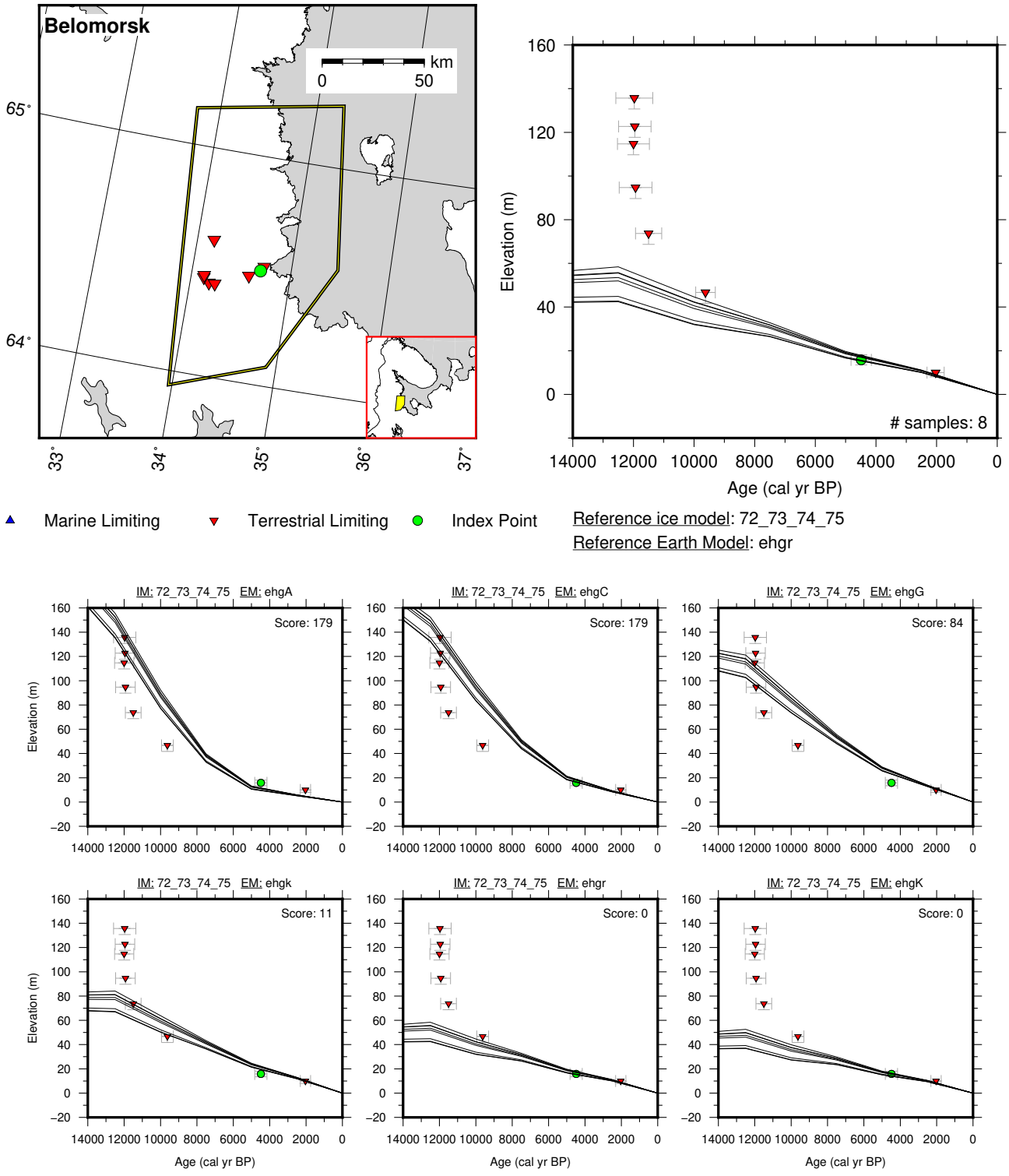


Figure 46: Paleo-sea level and comparison of six models for subregion White Sea, location Belomorsk.

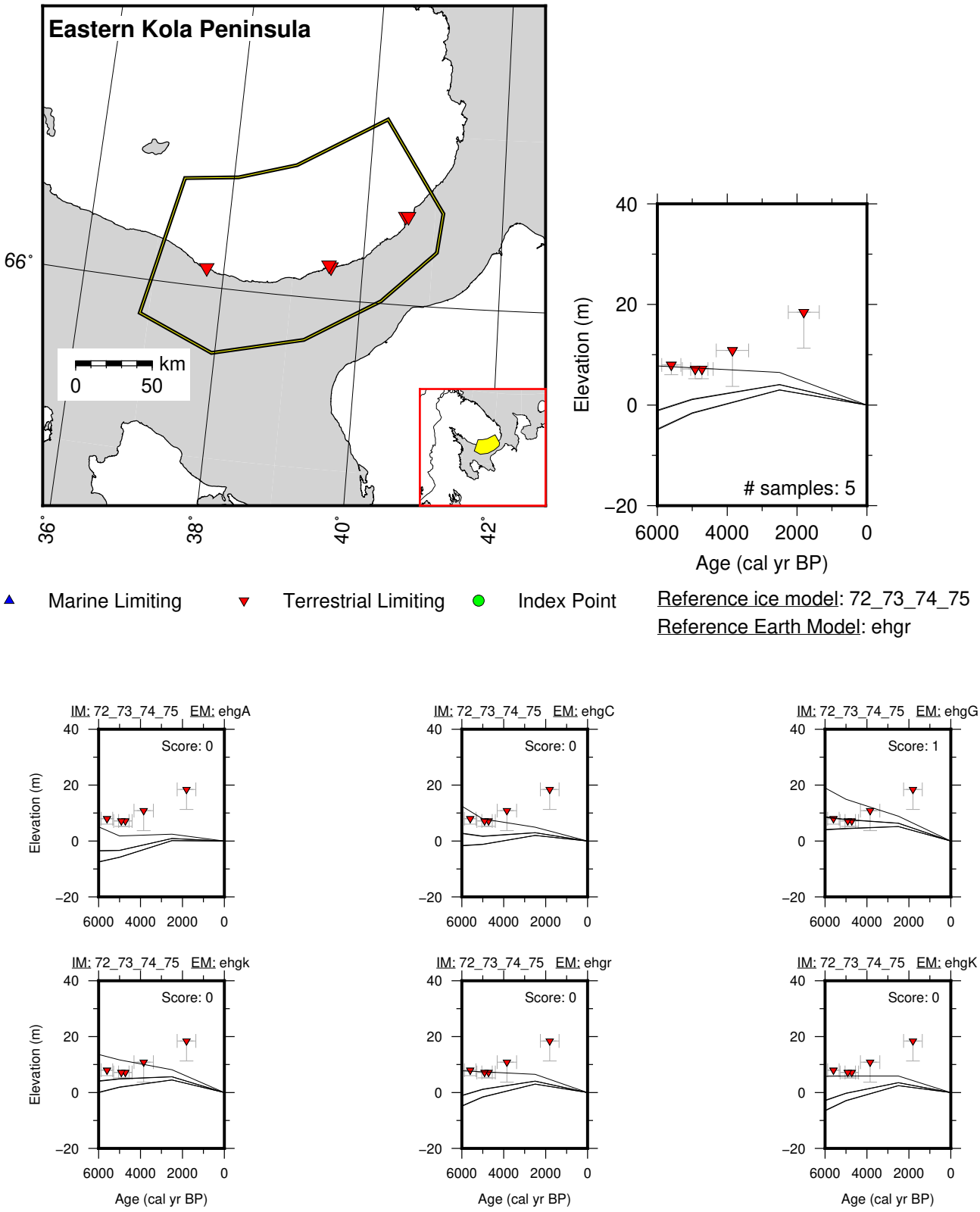


Figure 47: Paleo-sea level and comparison of six models for subregion White Sea, location Eastern Kola Peninsula.

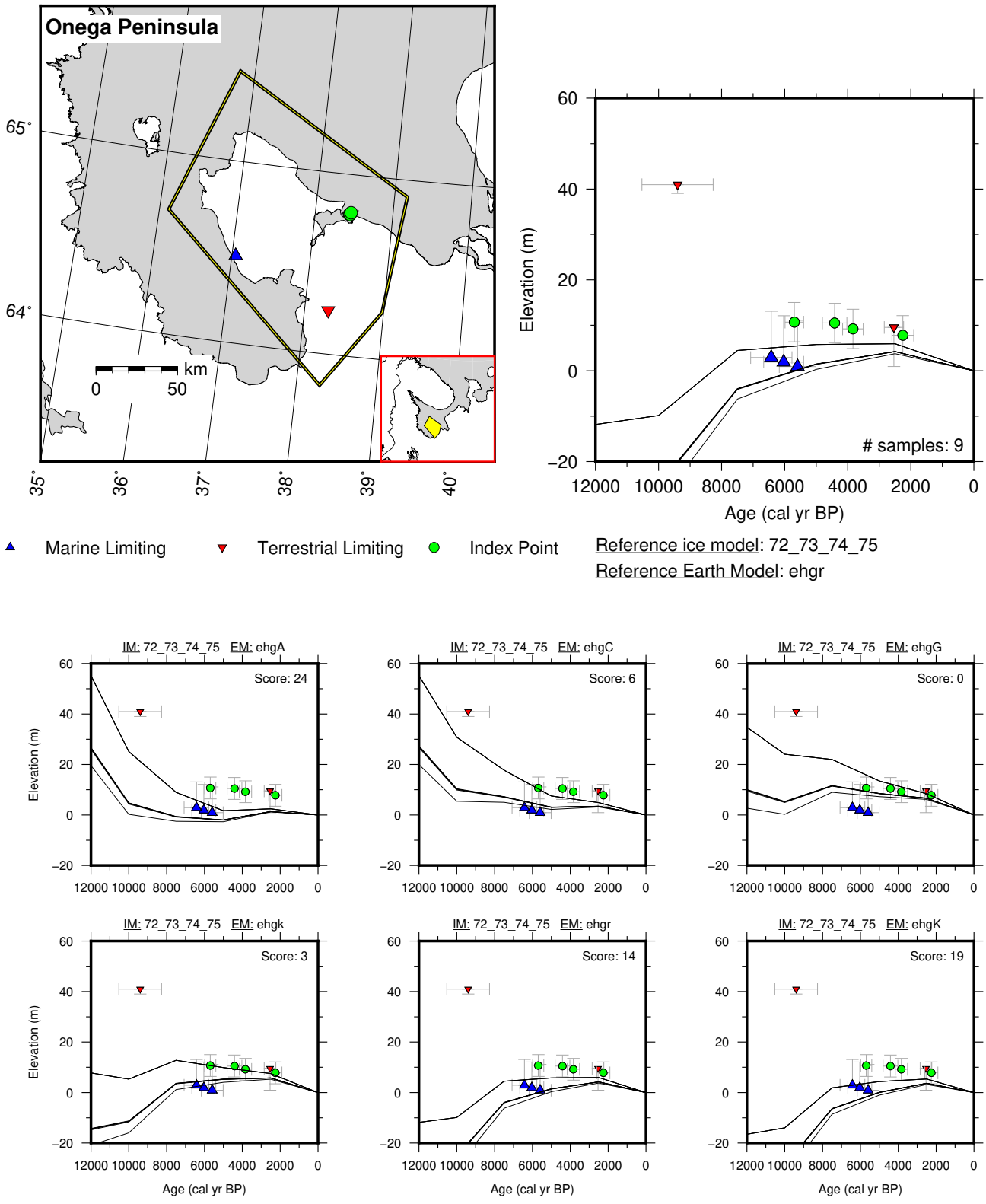


Figure 48: Paleo-sea level and comparison of six models for subregion White Sea, location Onega Peninsula.

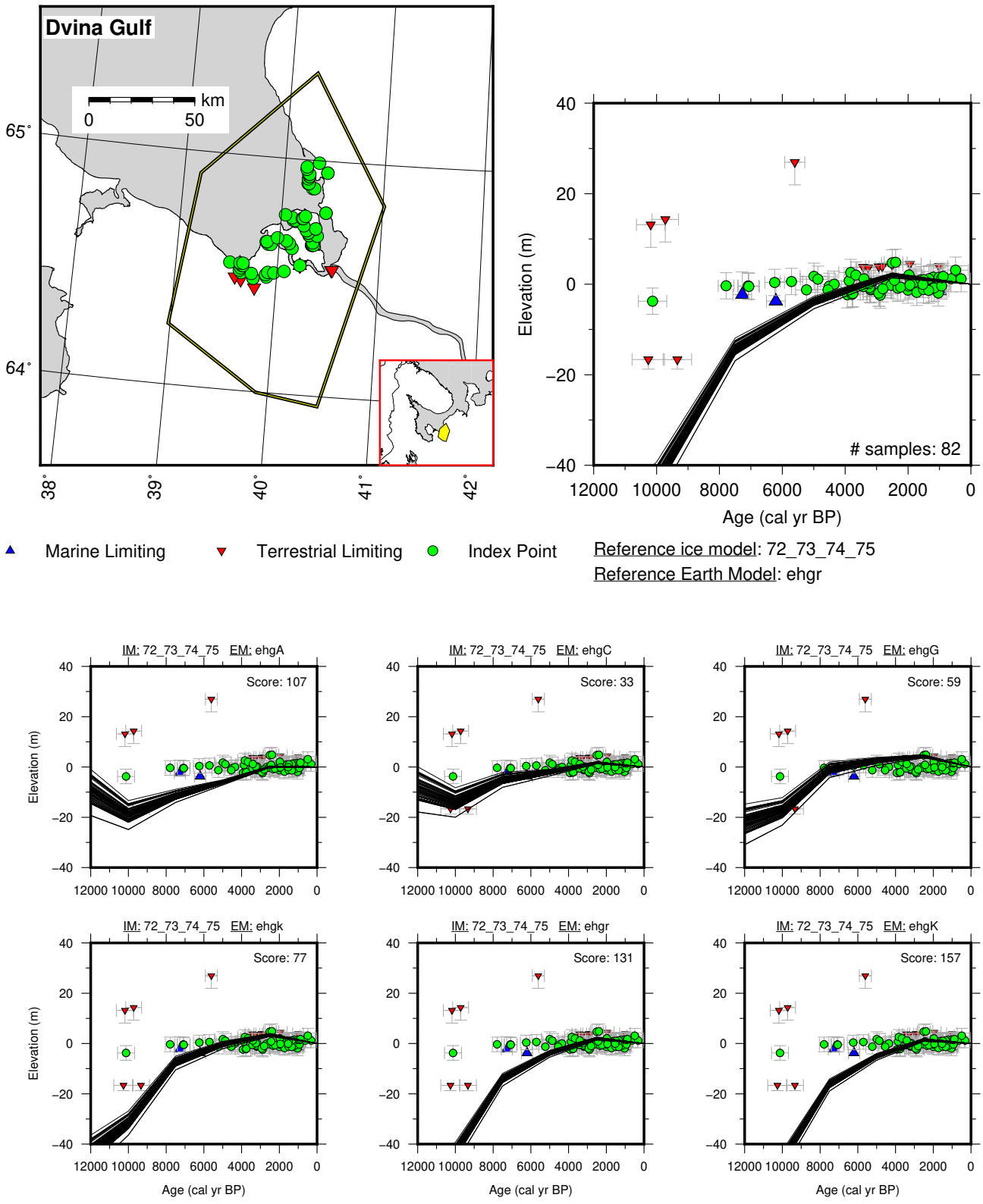


Figure 49: Paleo-sea level and comparison of six models for subregion White Sea, location Dvina Gulf.

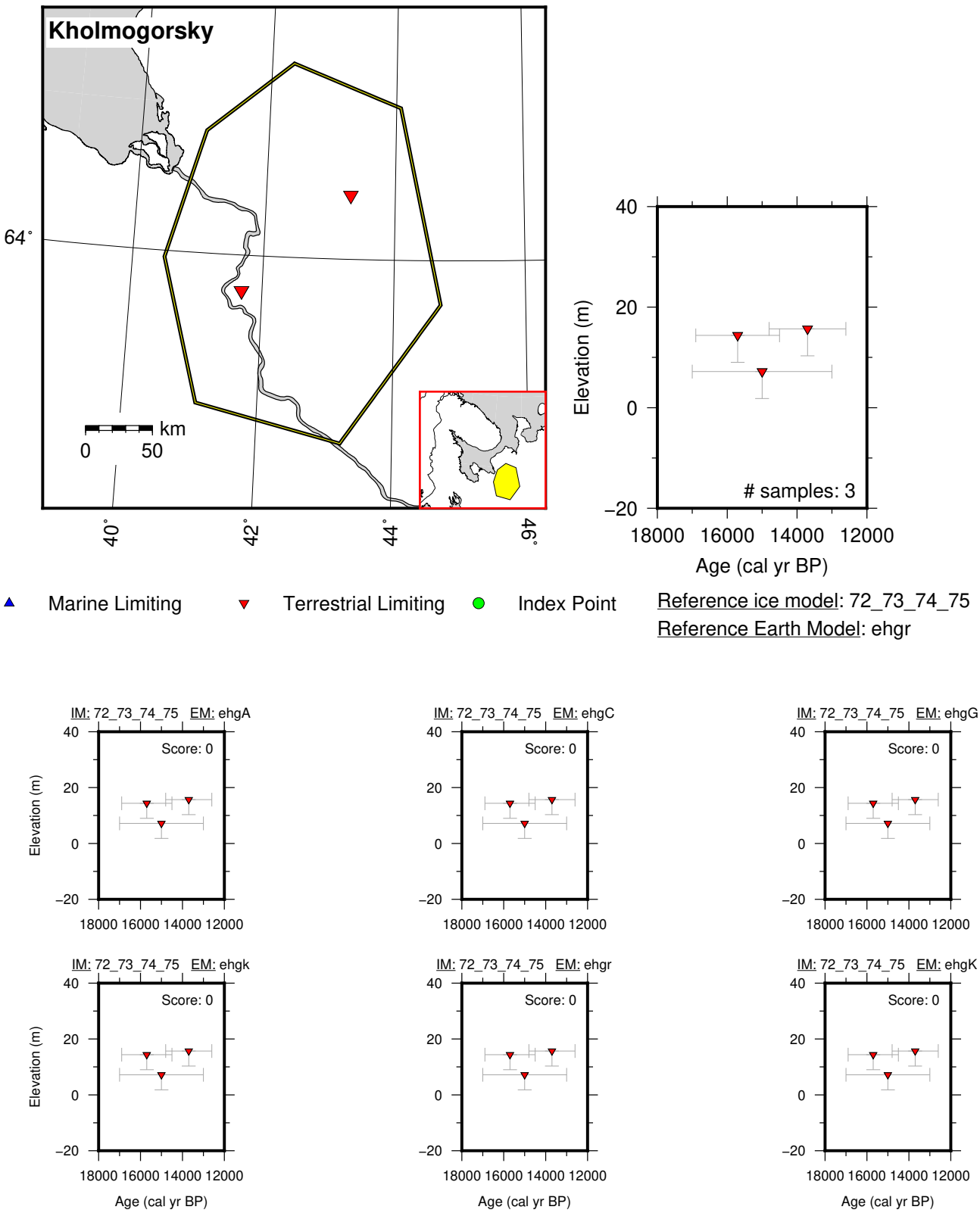


Figure 50: Paleo-sea level and comparison of six models for subregion White Sea, location Kholmogorsky.

8 Europe

8.1 Baltic Sea

References for the data used in each location.

Norrbotten:

Angermanland:

Gastrikland:

Stockholm:

Aland:

Oulu:

Ostrobothnia:

Turku:

Gulf Of Finland:

Gulf Of Riga:

Kaliningrad:

Bornholm:

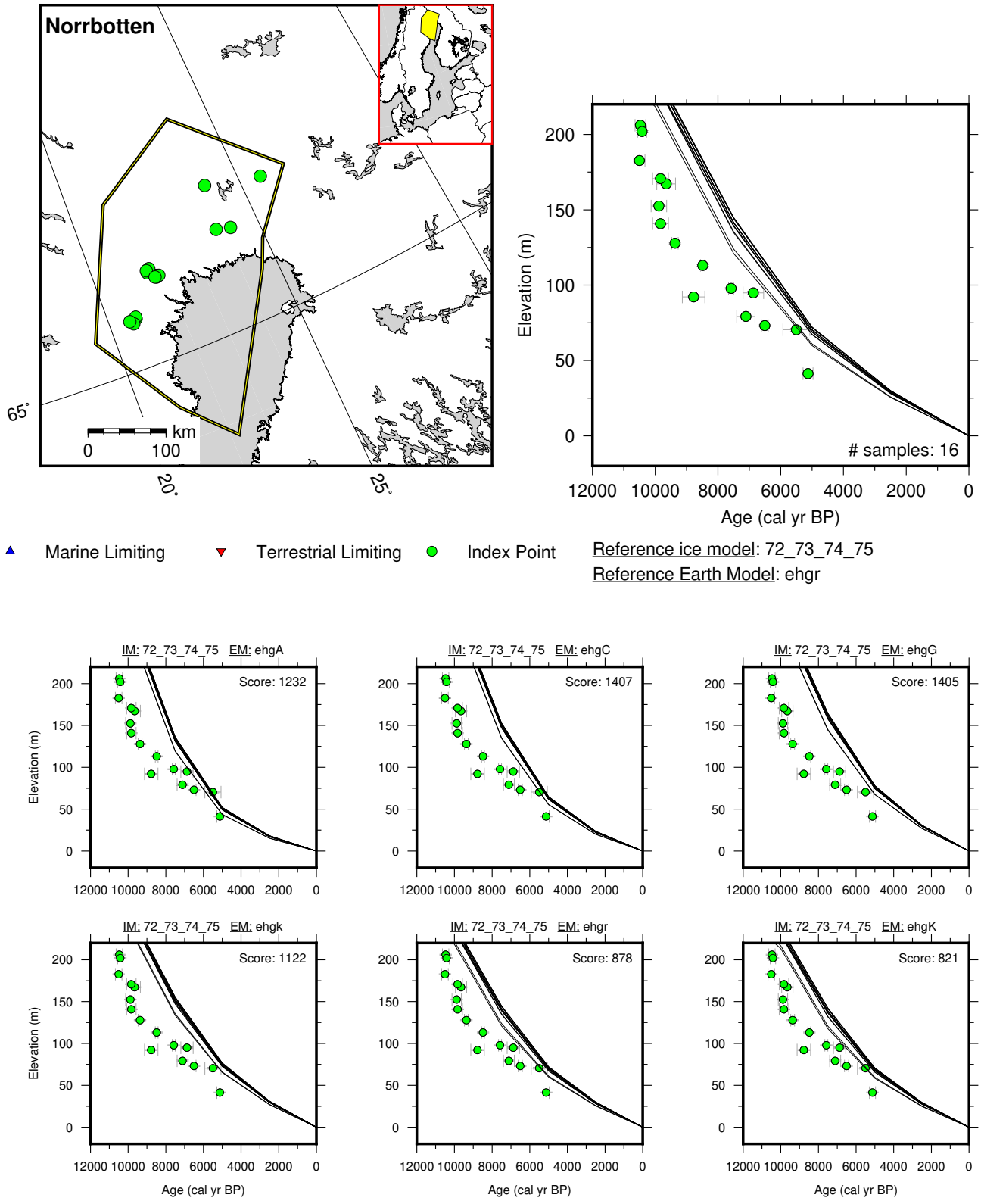


Figure 51: Paleo-sea level and comparison of six models for subregion Baltic Sea, location Norrbotten.

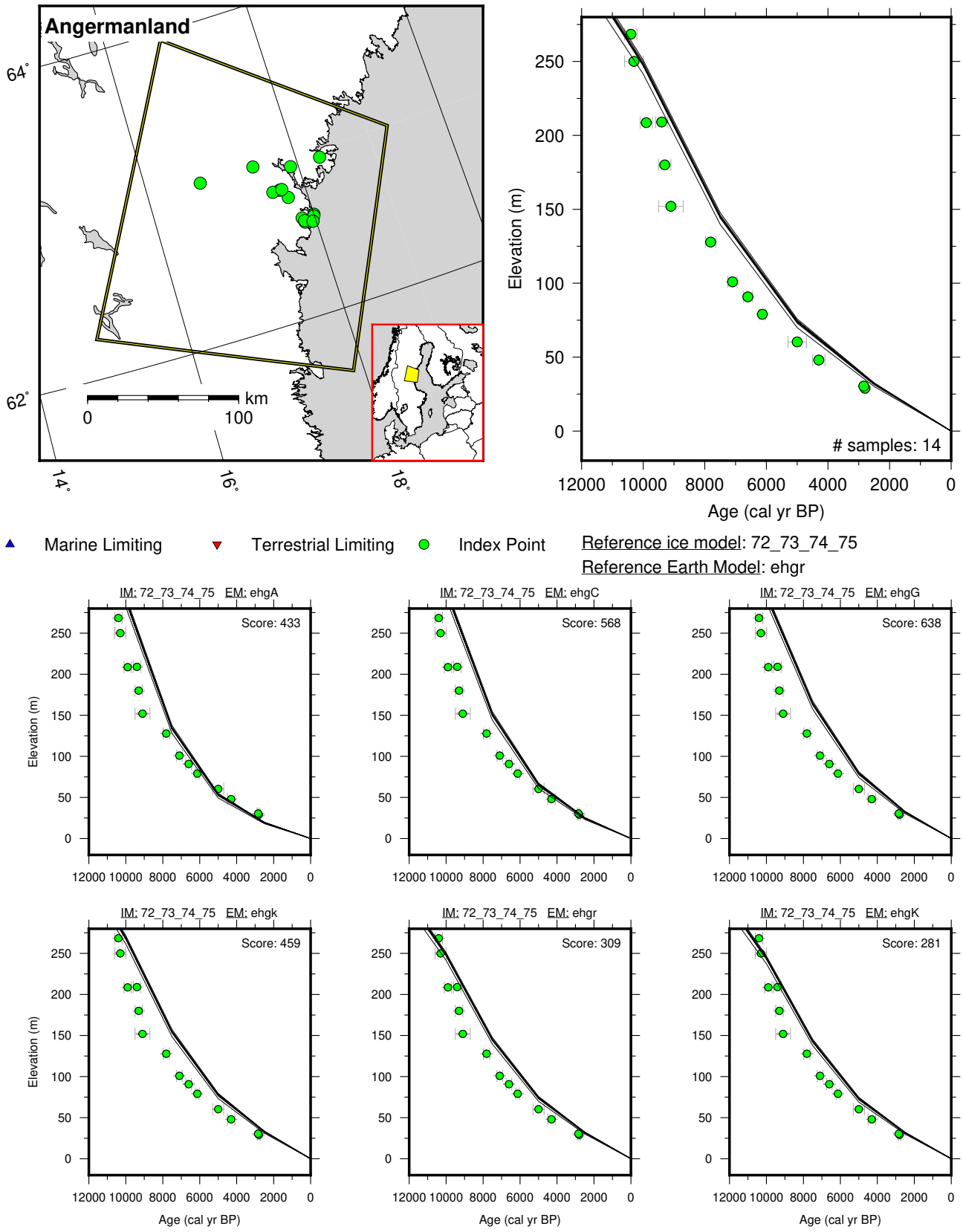


Figure 52: Paleo-sea level and comparison of six models for subregion Baltic Sea, location Angermanland.

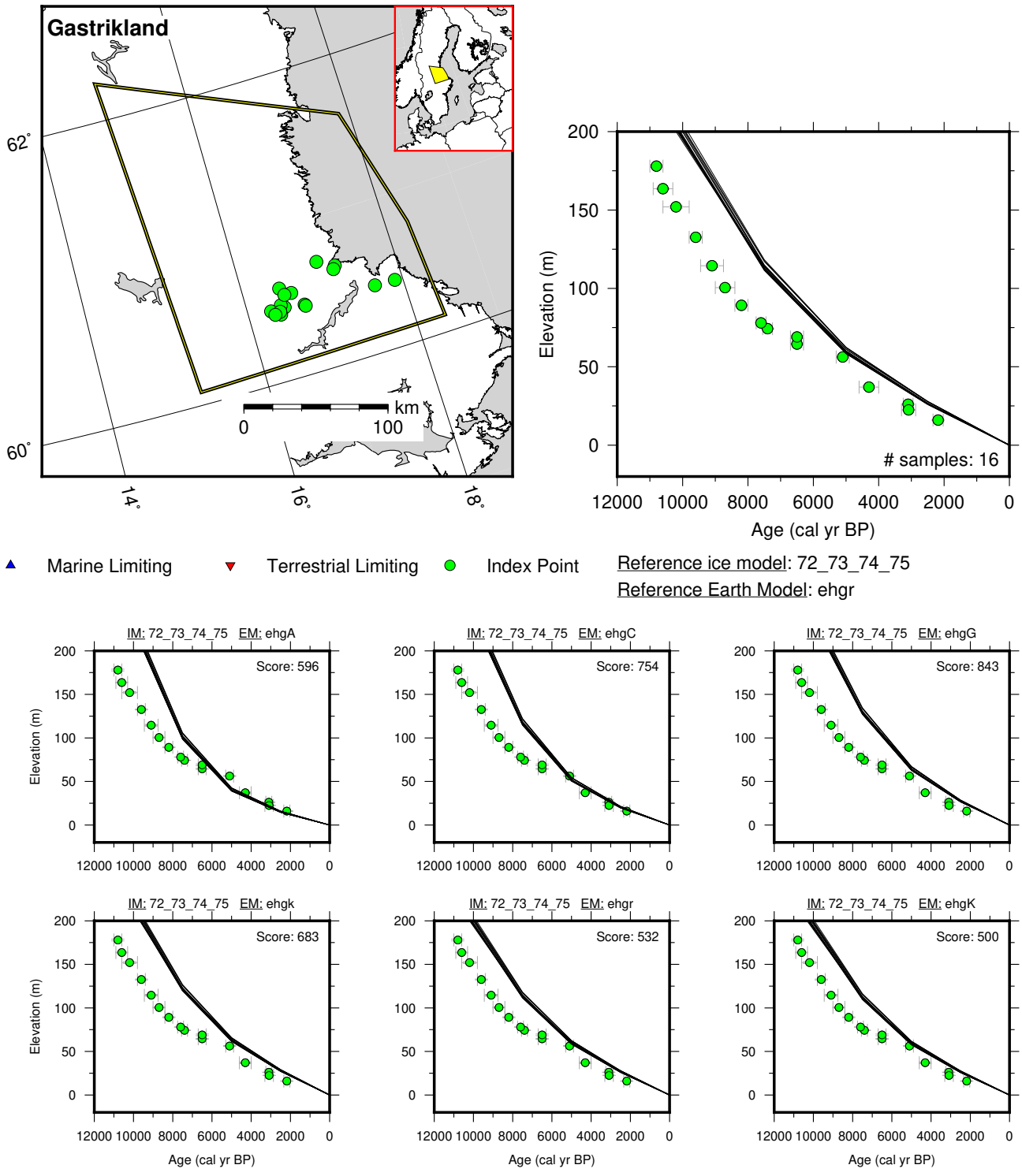


Figure 53: Paleo-sea level and comparison of six models for subregion Baltic Sea, location Gastrikland.

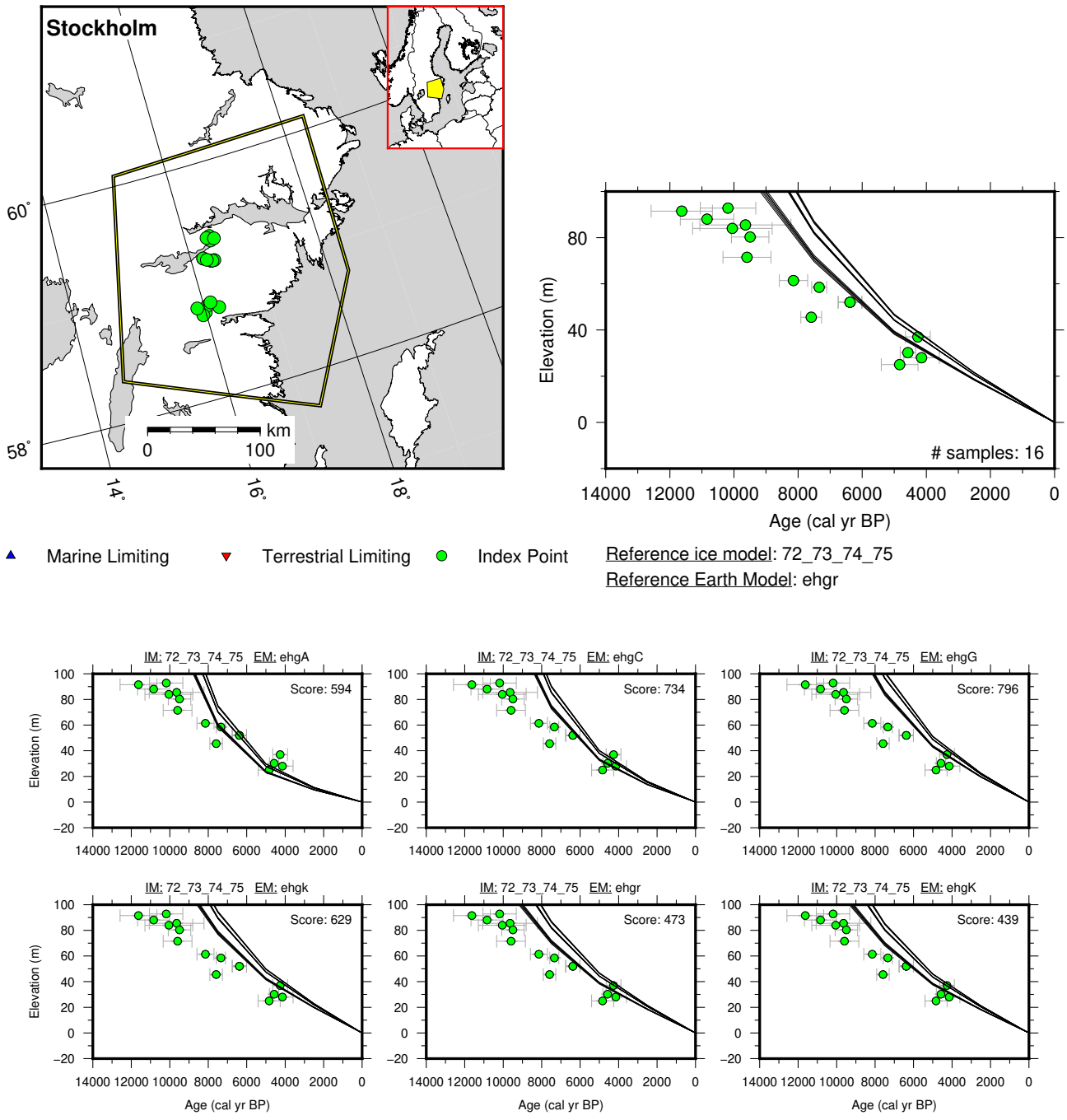


Figure 54: Paleo-sea level and comparison of six models for subregion Baltic Sea, location Stockholm.

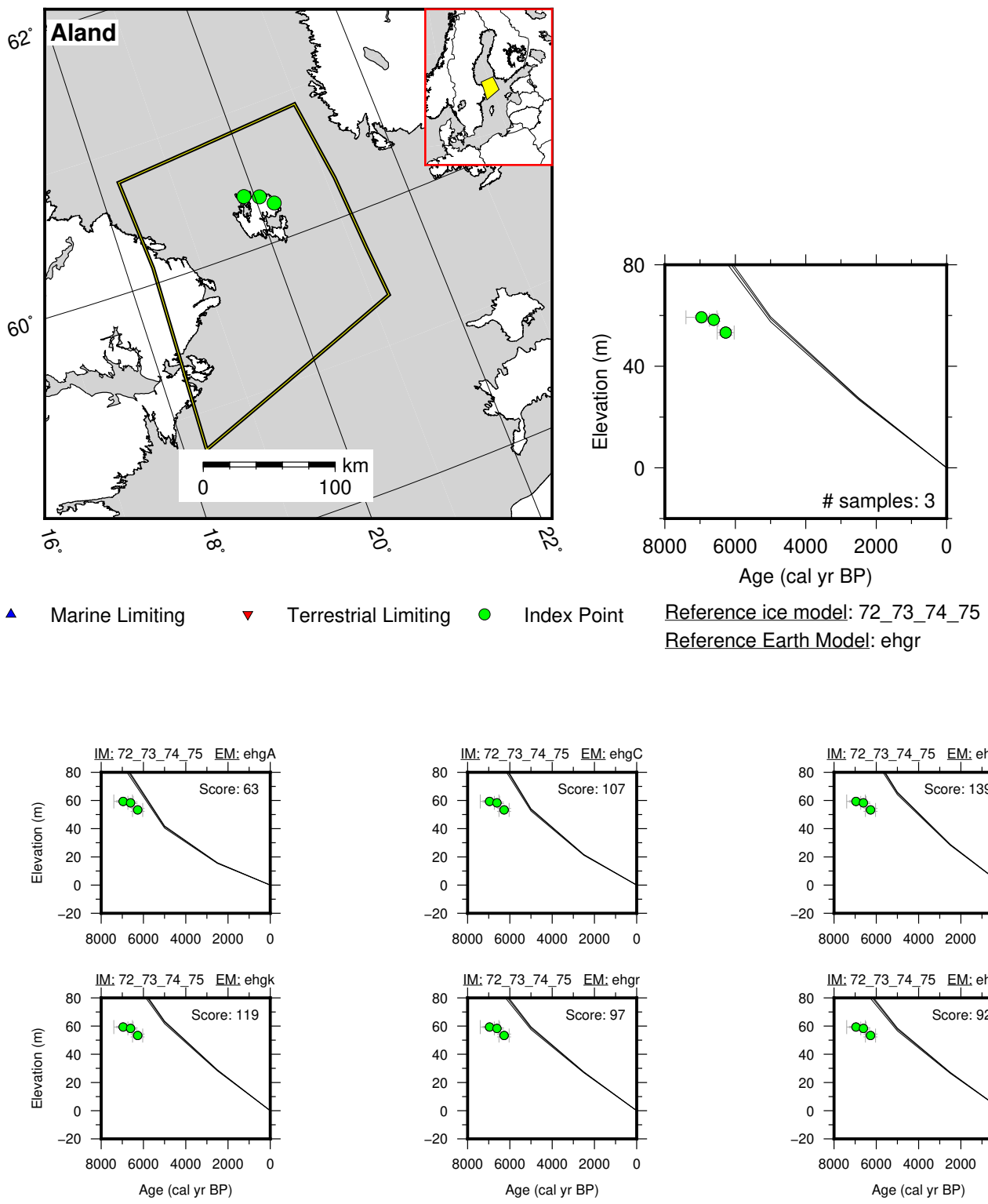


Figure 55: Paleo-sea level and comparison of six models for subregion Baltic Sea, location Aland.

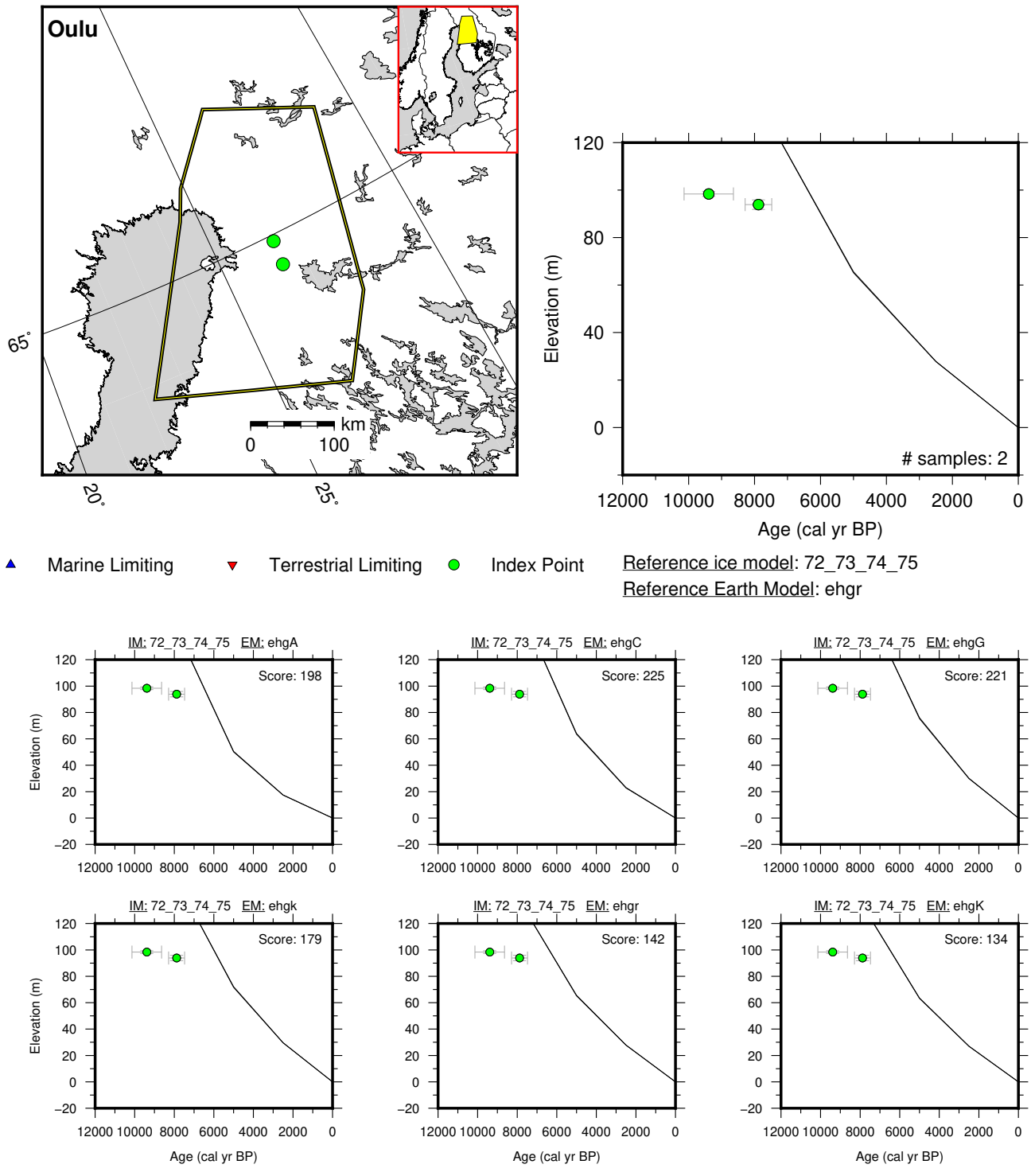


Figure 56: Paleo-sea level and comparison of six models for subregion Baltic Sea, location Oulu.

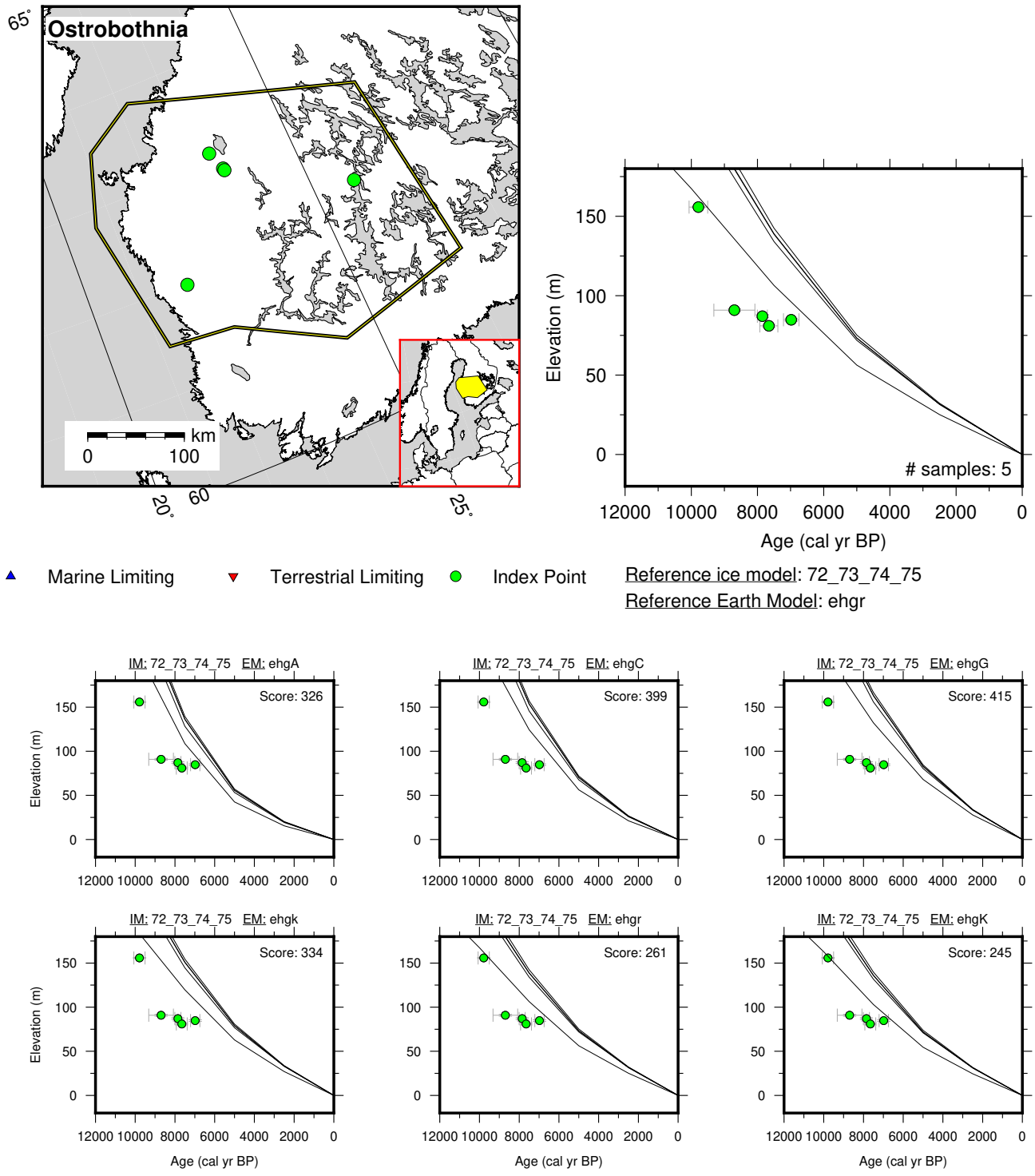


Figure 57: Paleo-sea level and comparison of six models for subregion Baltic Sea, location Ostrobothnia.

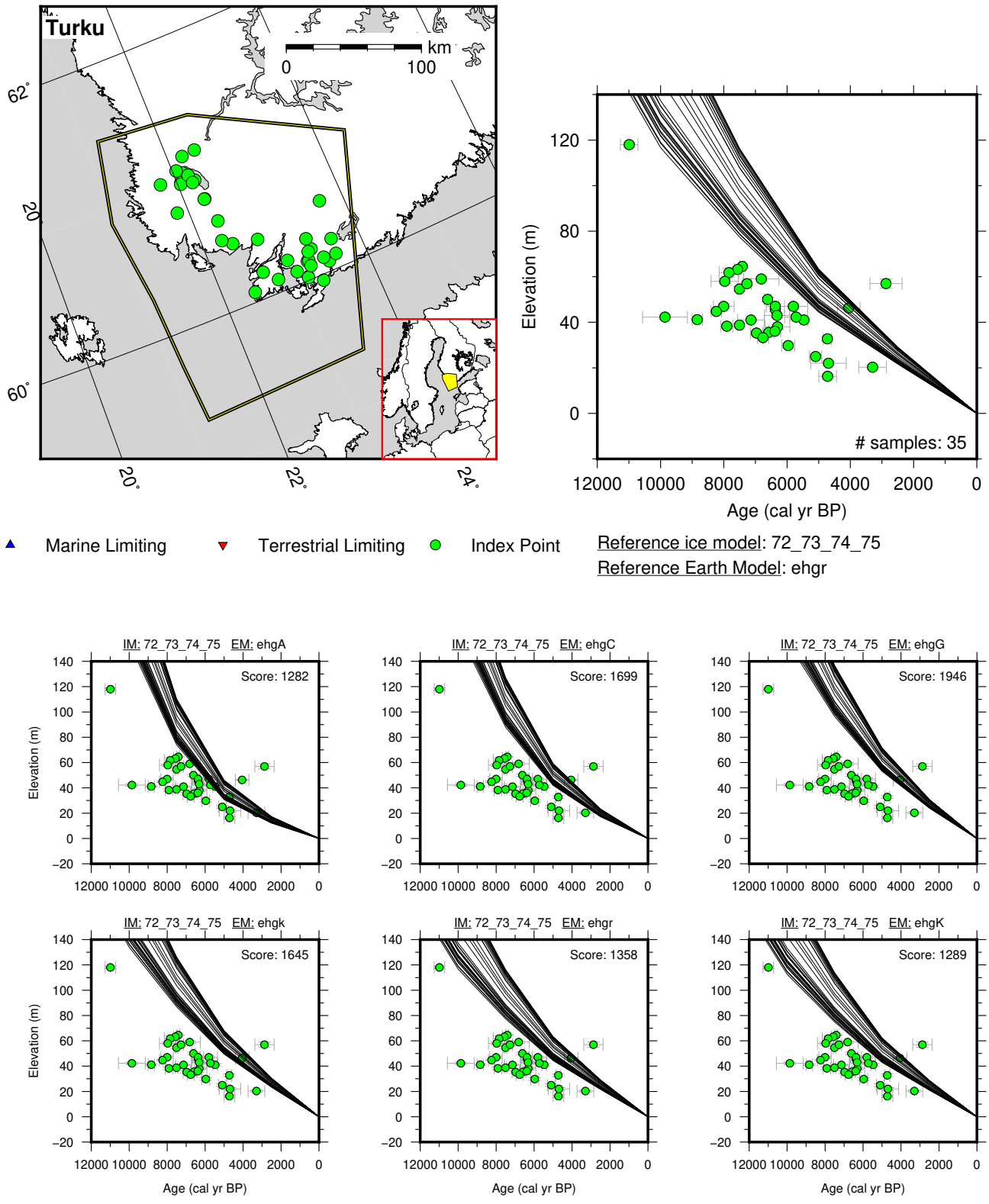


Figure 58: Paleo-sea level and comparison of six models for subregion Baltic Sea, location Turku.

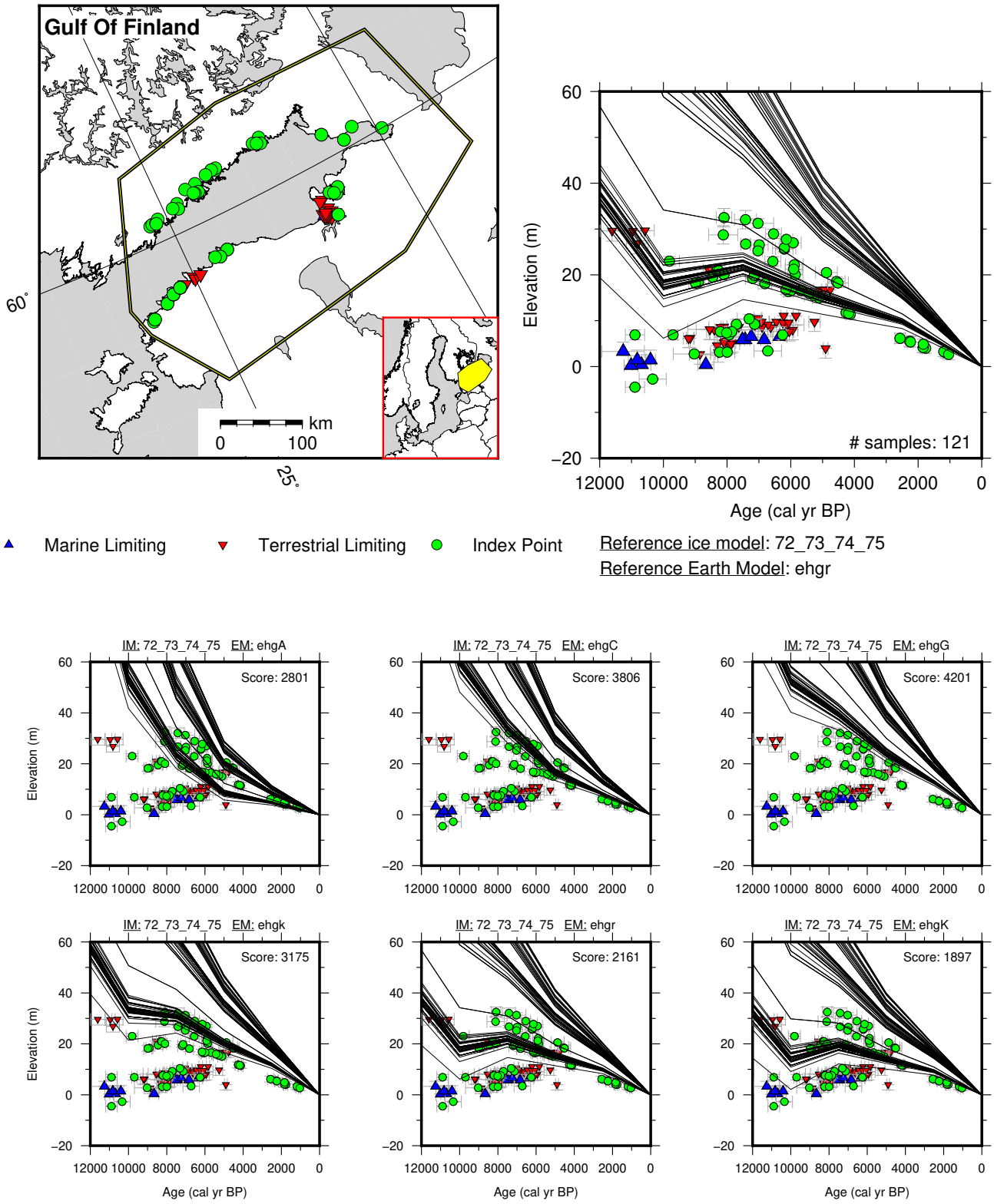


Figure 59: Paleo-sea level and comparison of six models for subregion Baltic Sea, location Gulf Of Finland.

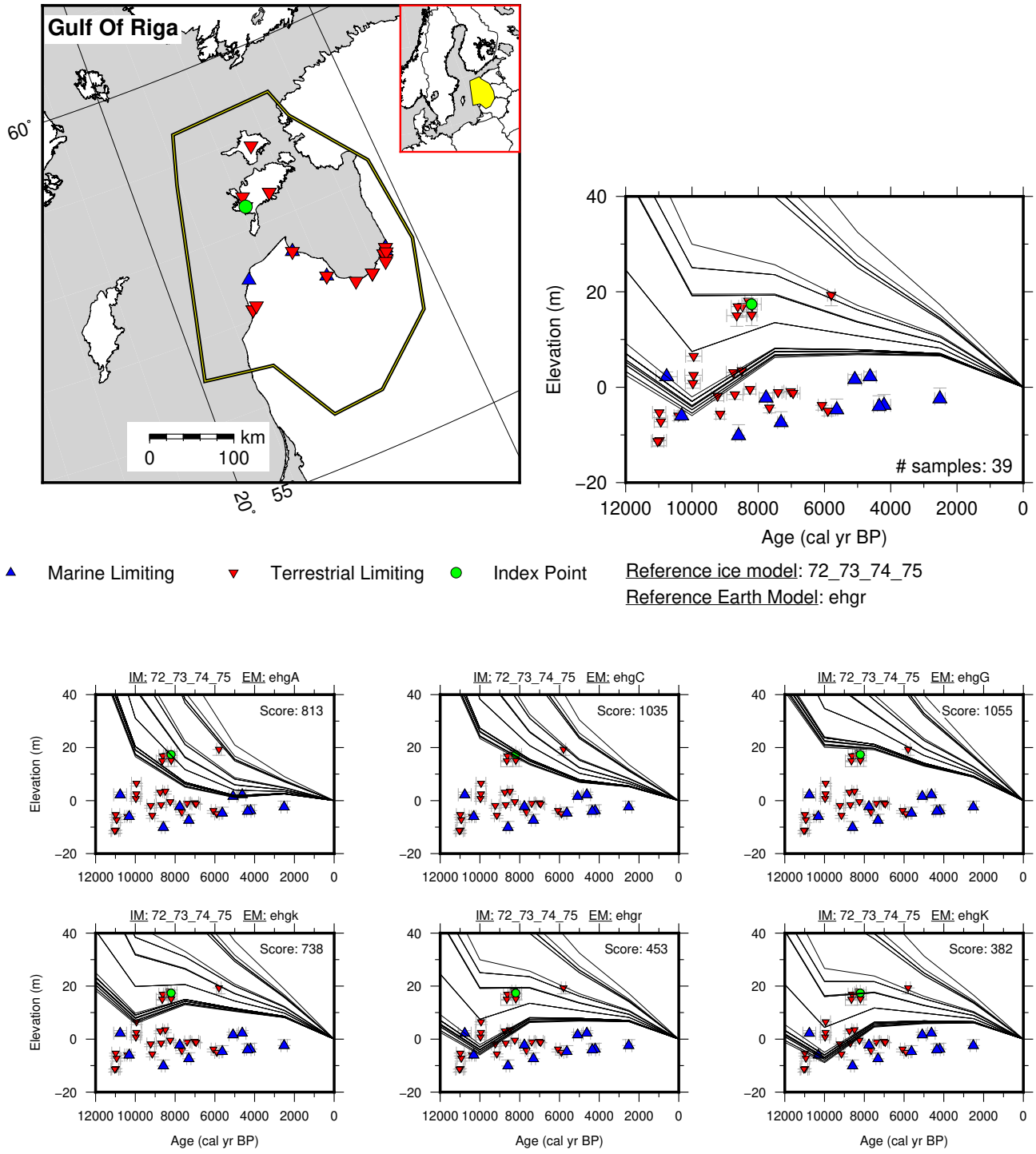


Figure 60: Paleo-sea level and comparison of six models for subregion Baltic Sea, location Gulf Of Riga.

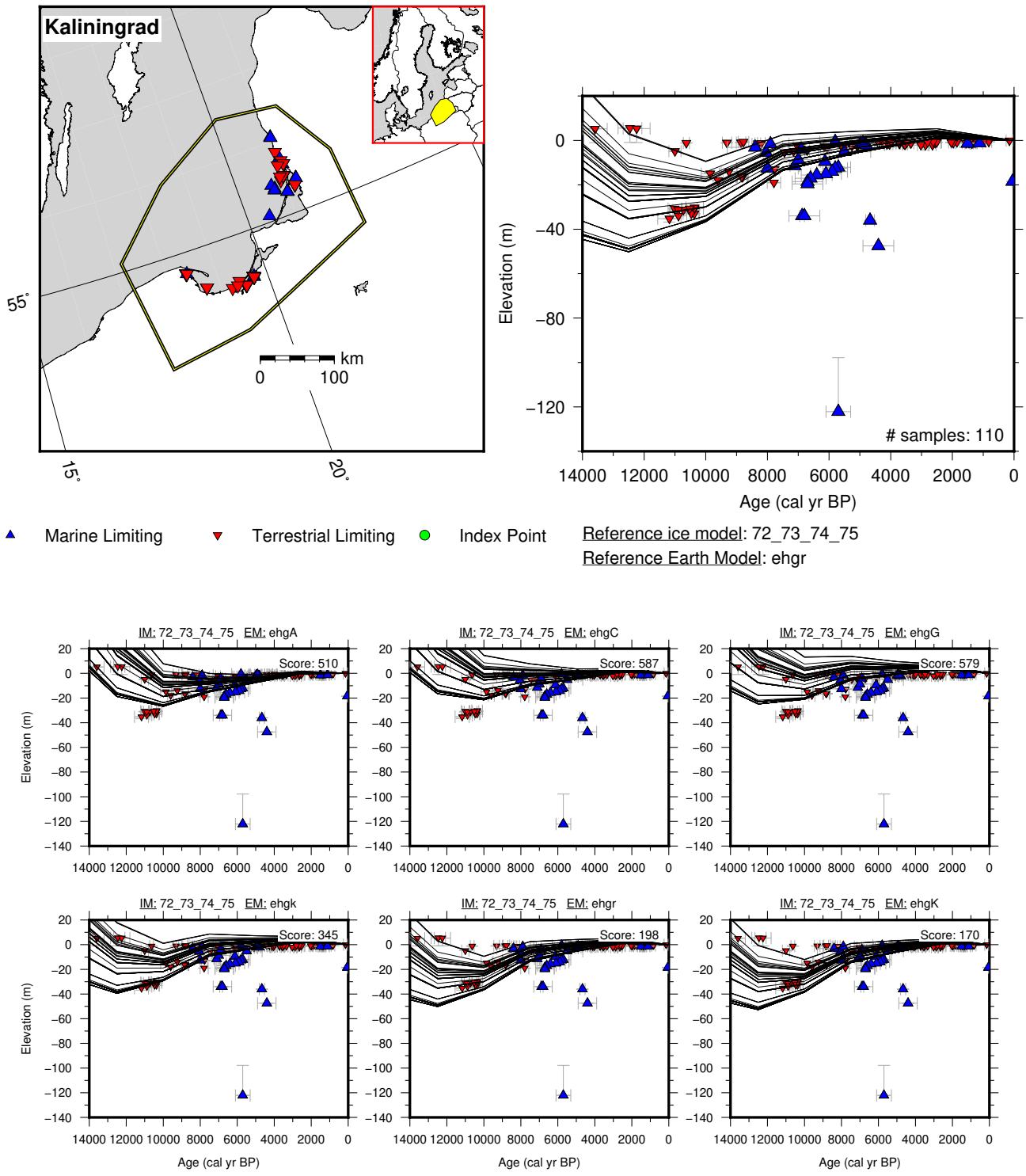


Figure 61: Paleo-sea level and comparison of six models for subregion Baltic Sea, location Kaliningrad.

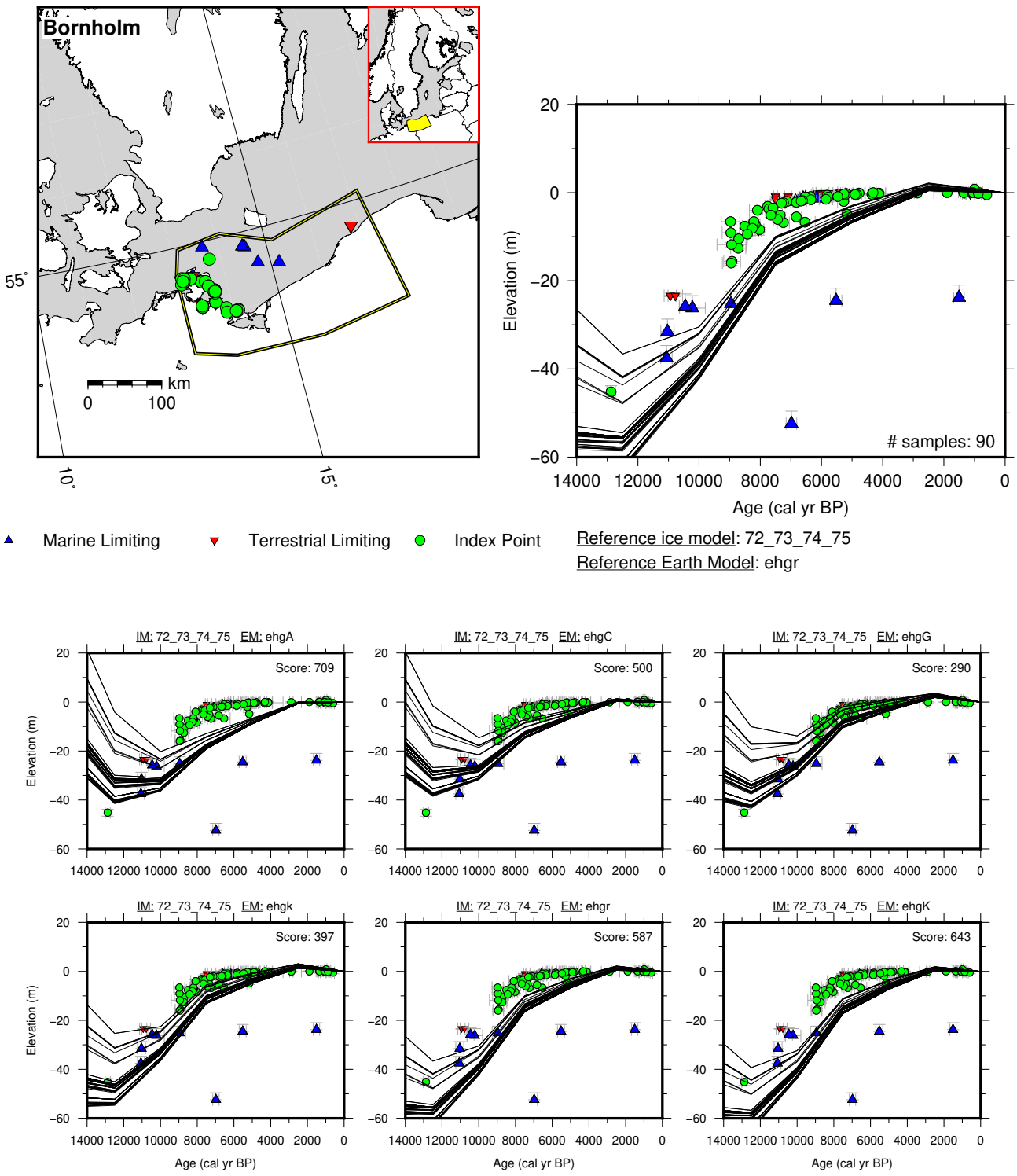


Figure 62: Paleo-sea level and comparison of six models for subregion Baltic Sea, location Bornholm.

8.2 Danish straits - Kattegat - Skagerrak

References for the data used in each location.

Mecklenburg:

Kiel:

Great Belt:

Copenhagen:

Kattegat:

Northern Jylland:

Limfjord:

Halland:

Halden: Sørensen (1999)

Ski: Gulliksen et al. (1975); Sørensen (1979)

Kragerod Porsgrunn: Henningsmoen (1979); Stabell (1980)

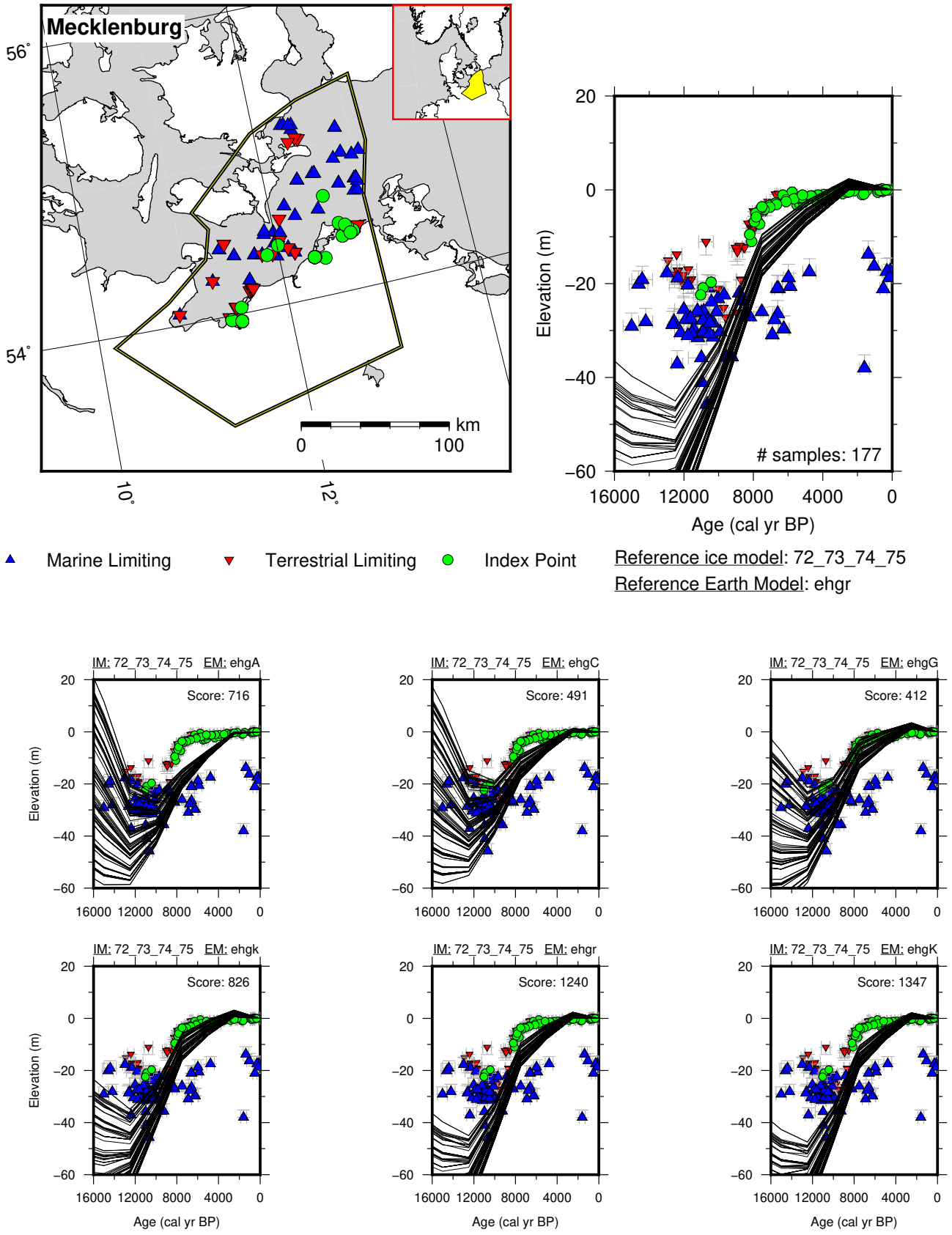


Figure 63: Paleo-sea level and comparison of six models for subregion Danish straits - Kattegat - Skagerrak, location Mecklenburg.

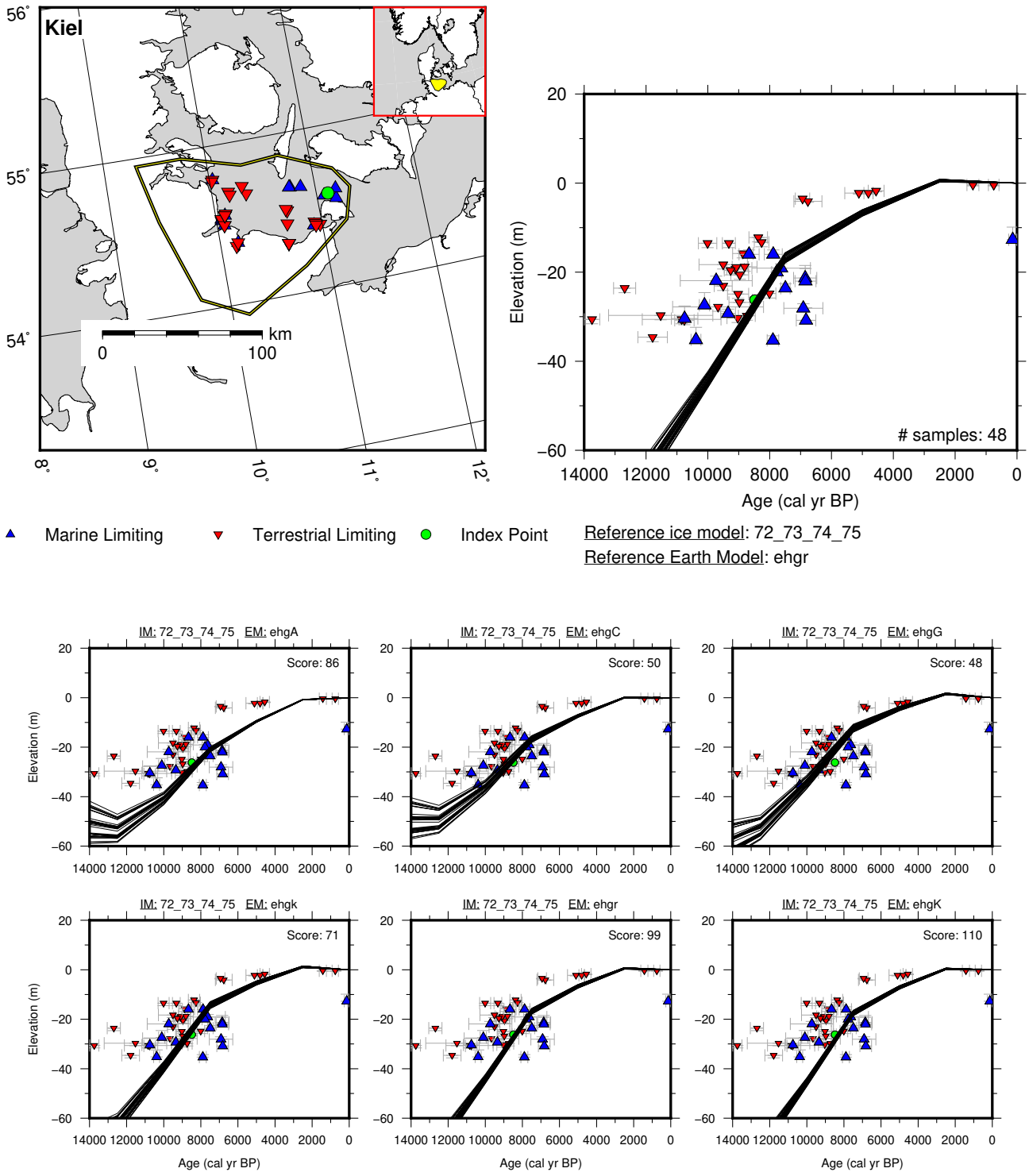


Figure 64: Paleo-sea level and comparison of six models for subregion Danish straits - Kattegat - Skagerrak, location Kiel.

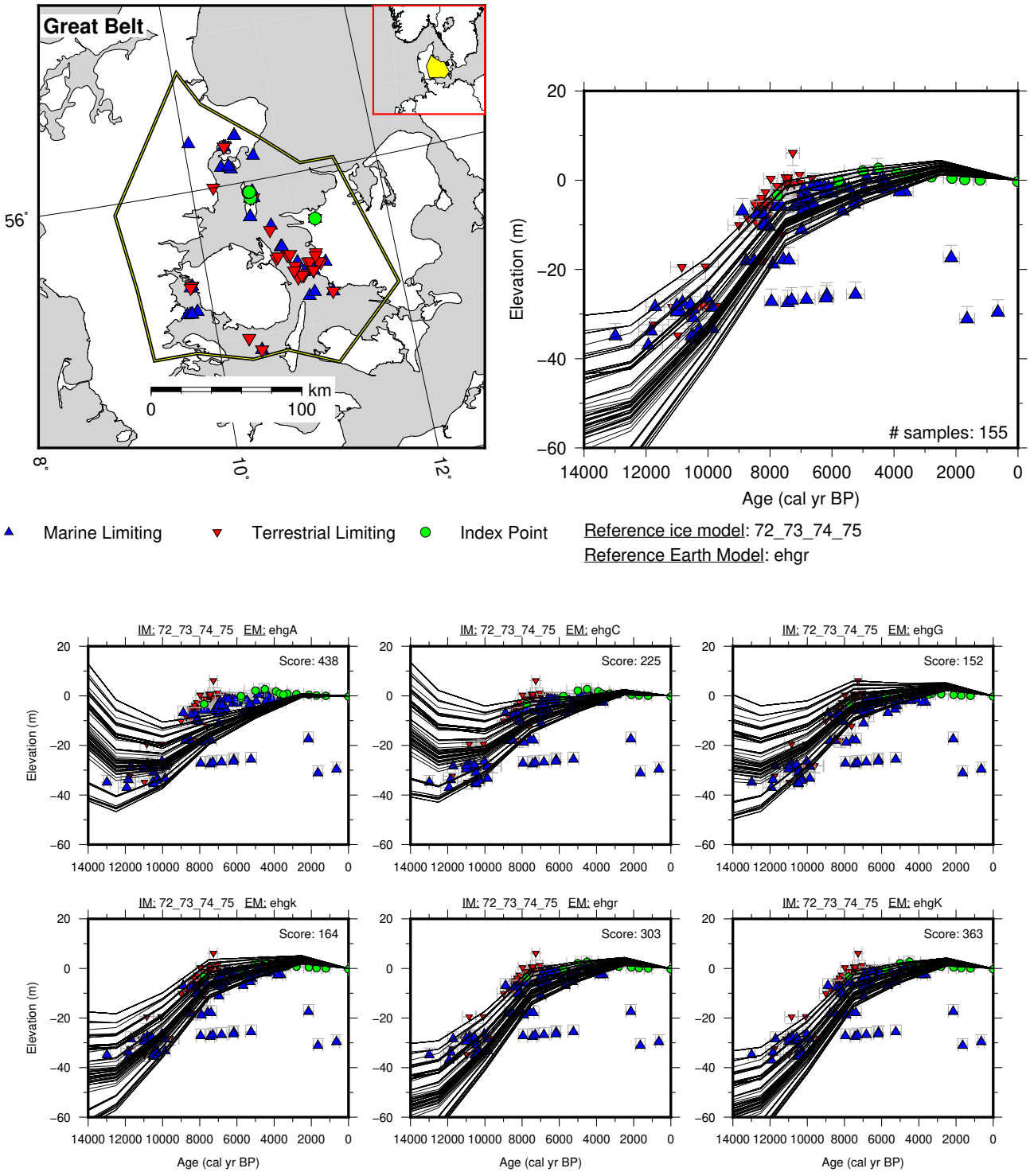


Figure 65: Paleo-sea level and comparison of six models for subregion Danish straits - Kattegat - Skagerrak, location Great Belt.

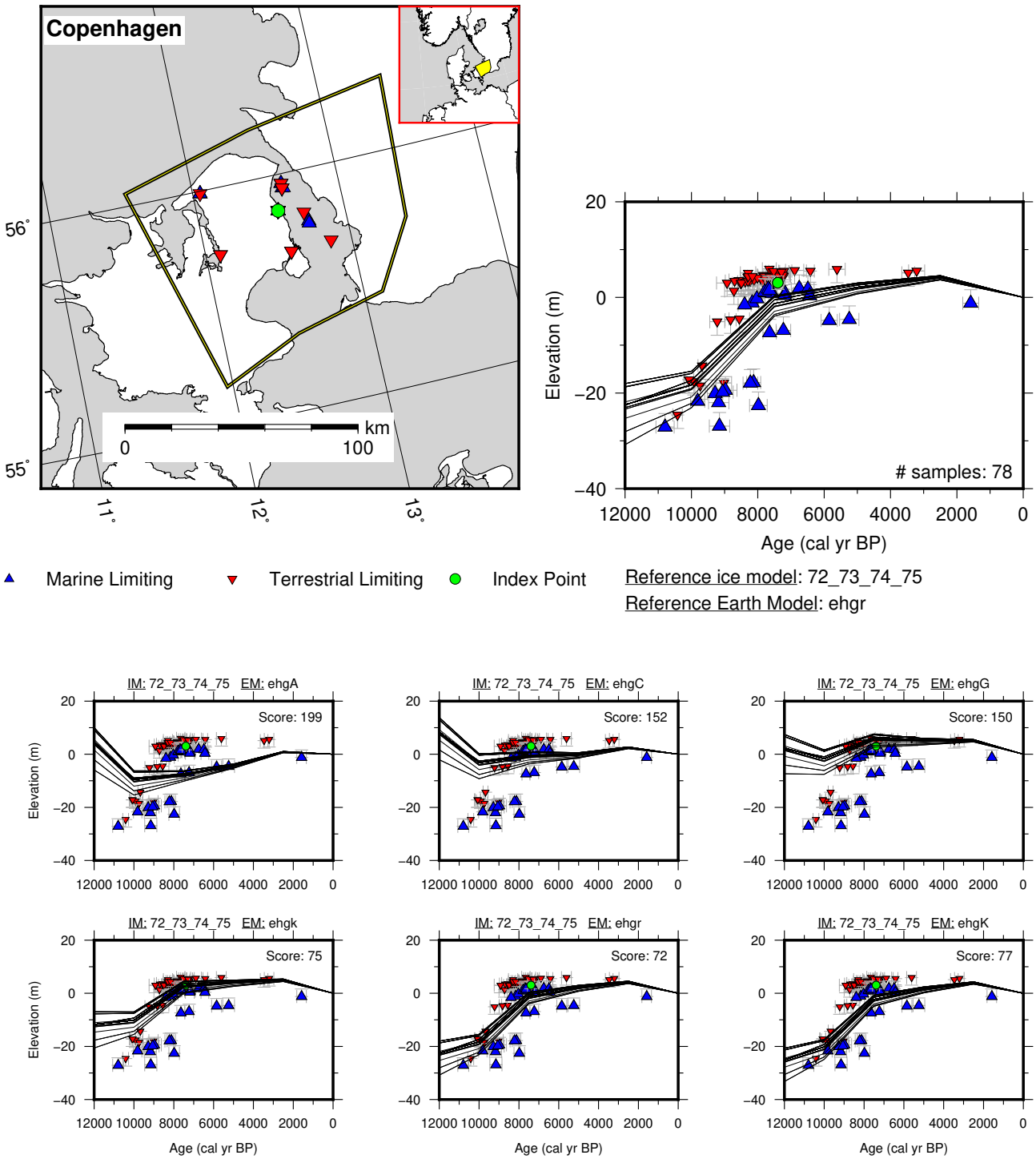


Figure 66: Paleo-sea level and comparison of six models for subregion Danish straits - Kattegat - Skagerrak, location Copenhagen.

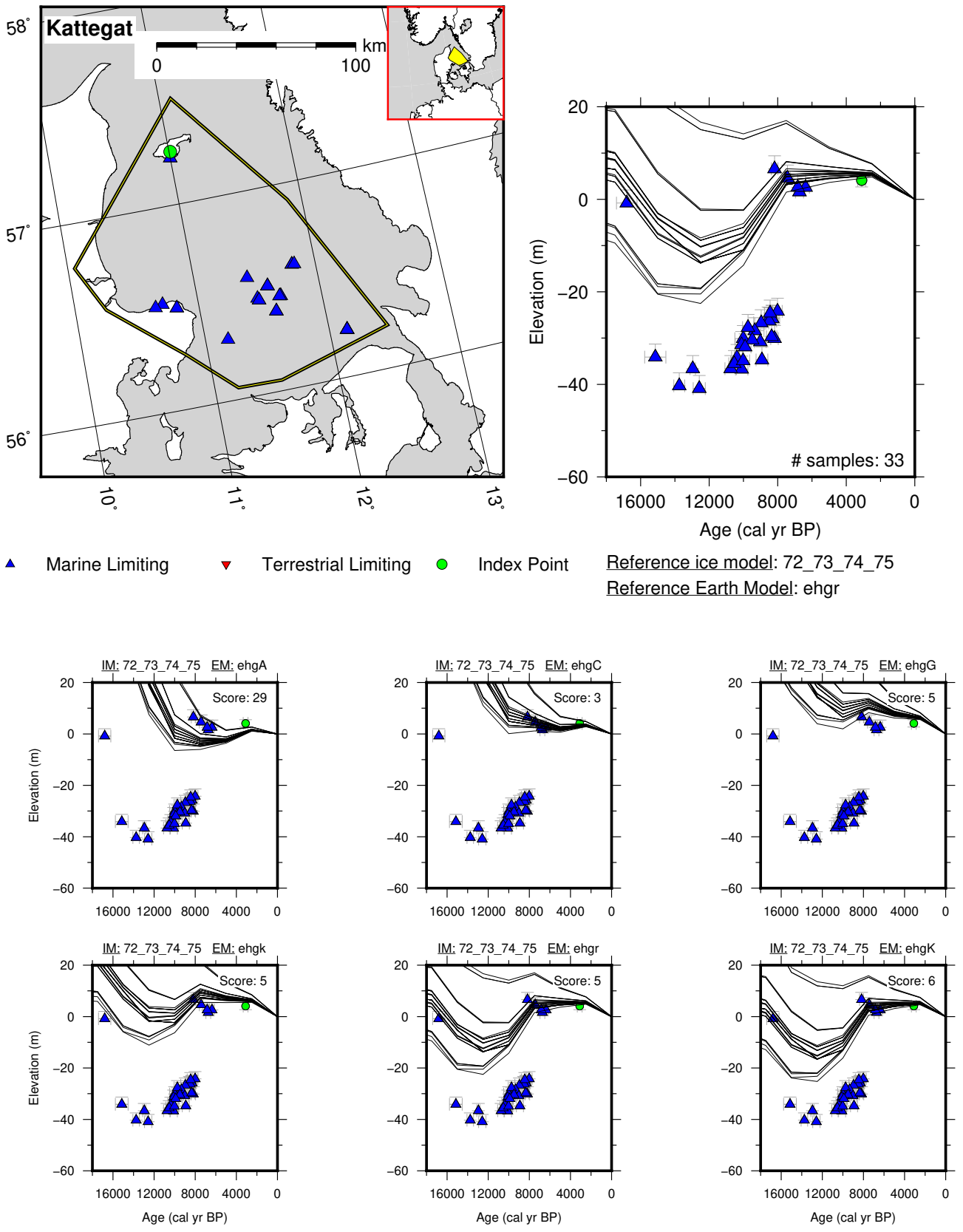
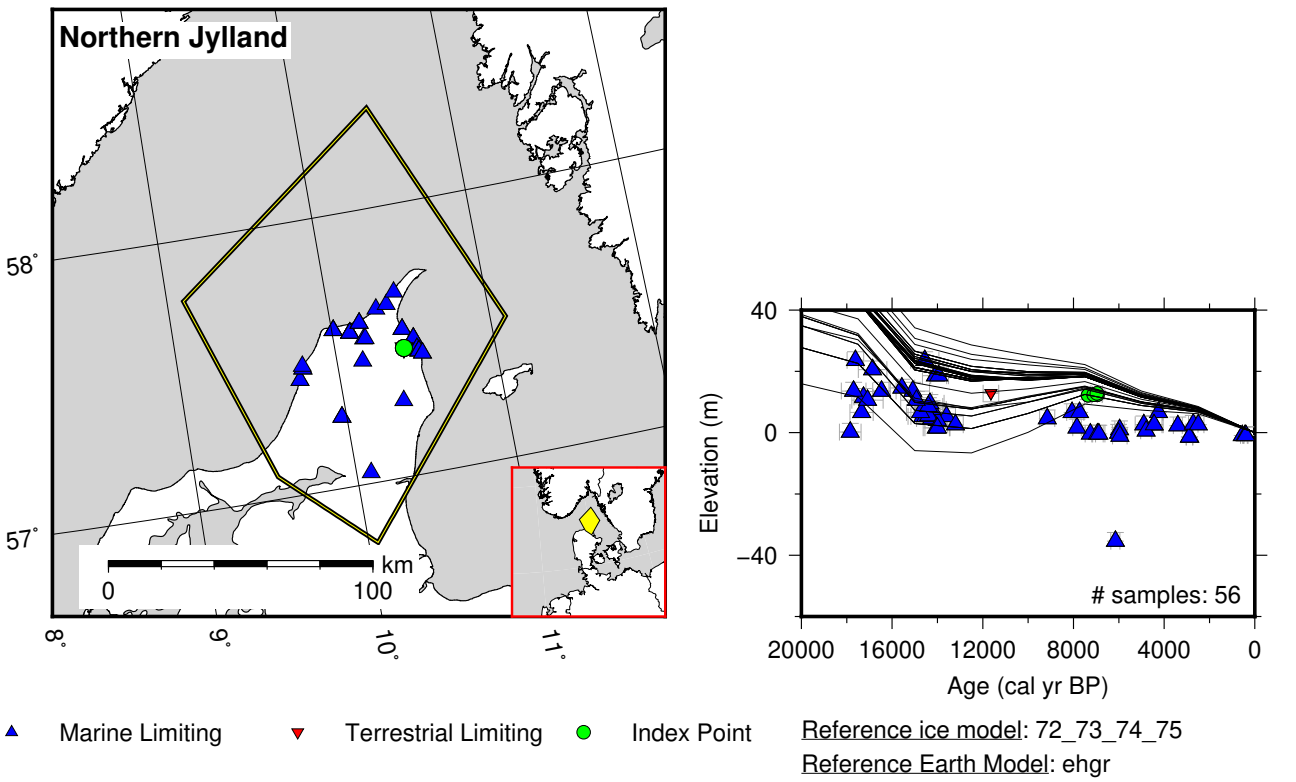


Figure 67: Paleo-sea level and comparison of six models for subregion Danish straits - Kattegat - Skagerrak, location Kattegat.



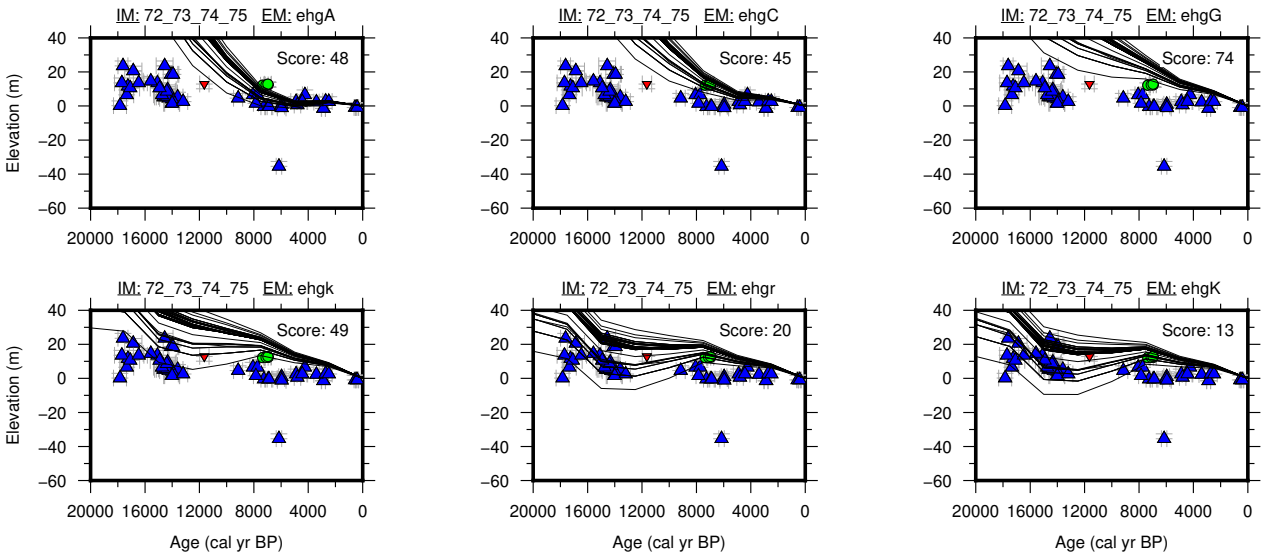


Figure 68: Paleo-sea level and comparison of six models for subregion Danish straits - Kattegat - Skagerrak, location Northern Jylland.

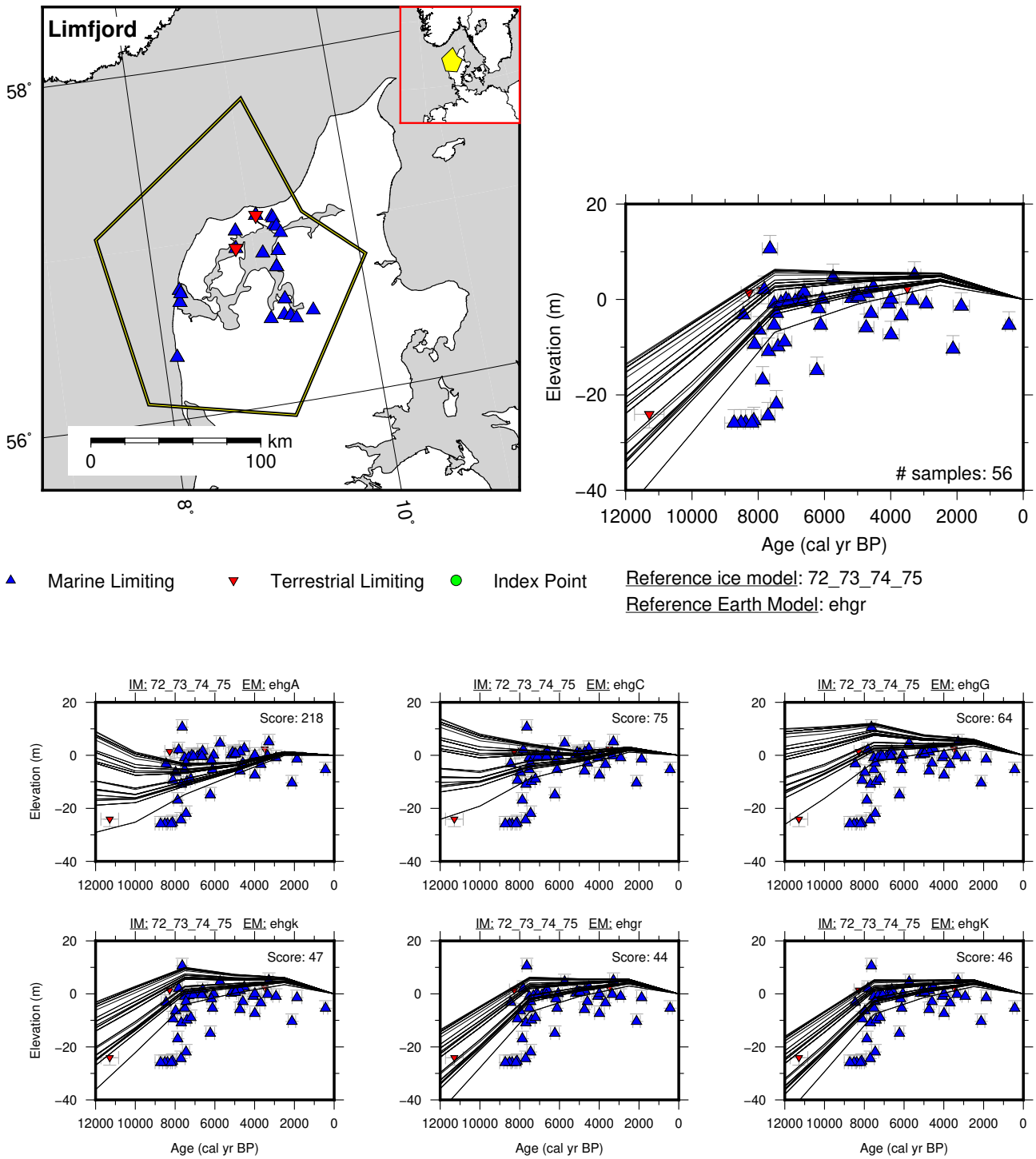
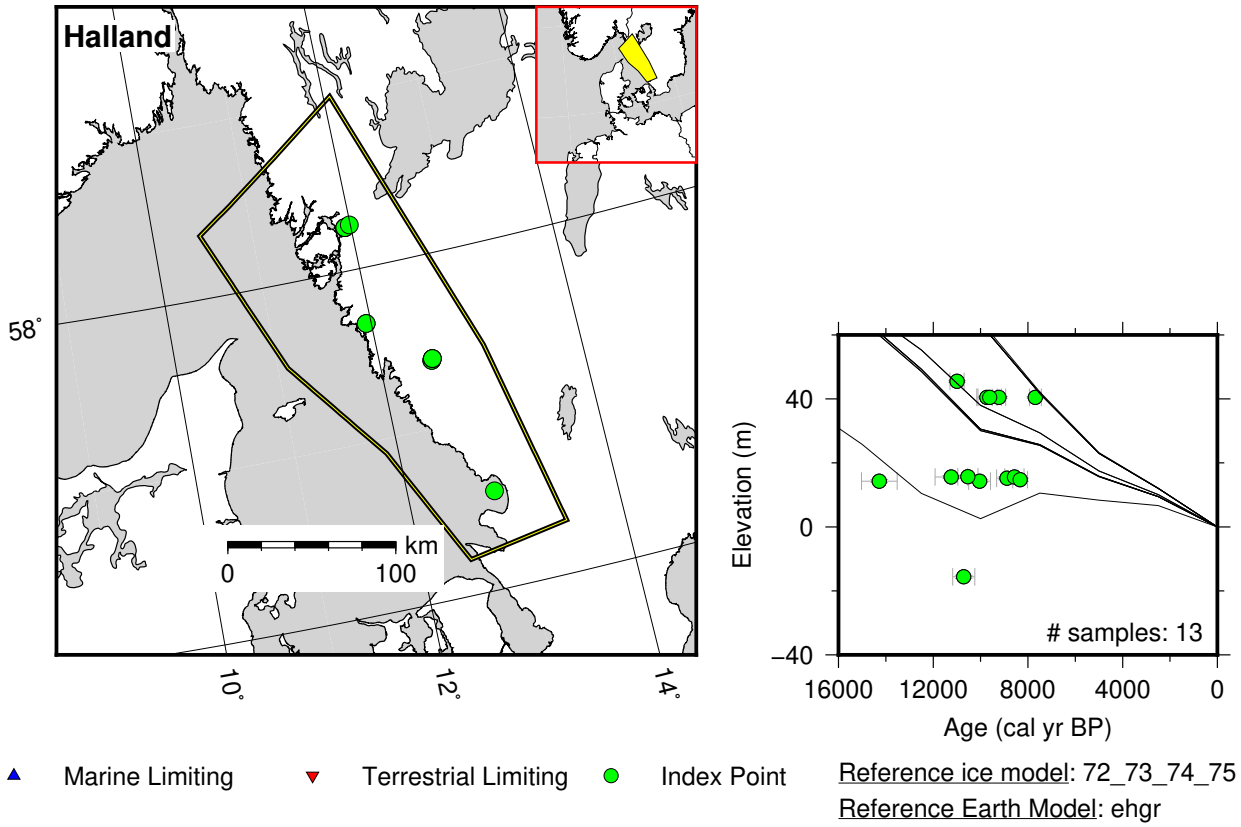


Figure 69: Paleo-sea level and comparison of six models for subregion Danish straits - Kattegat - Skagerrak, location Limfjord.



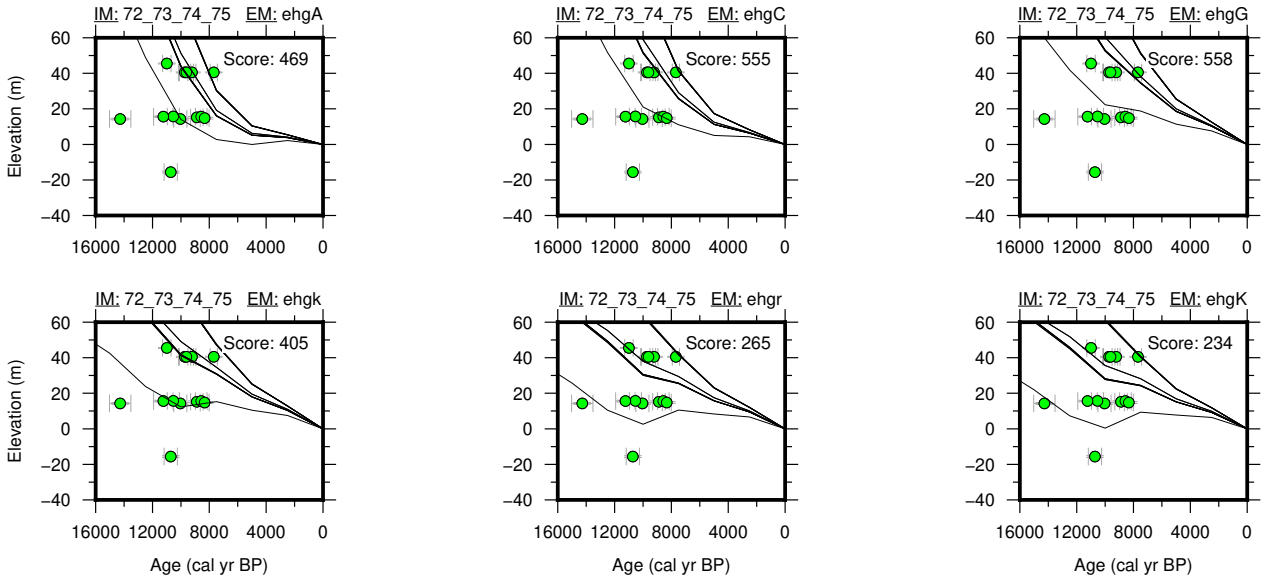


Figure 70: Paleo-sea level and comparison of six models for subregion Danish straits - Kattegat - Skagerrak, location Halland.

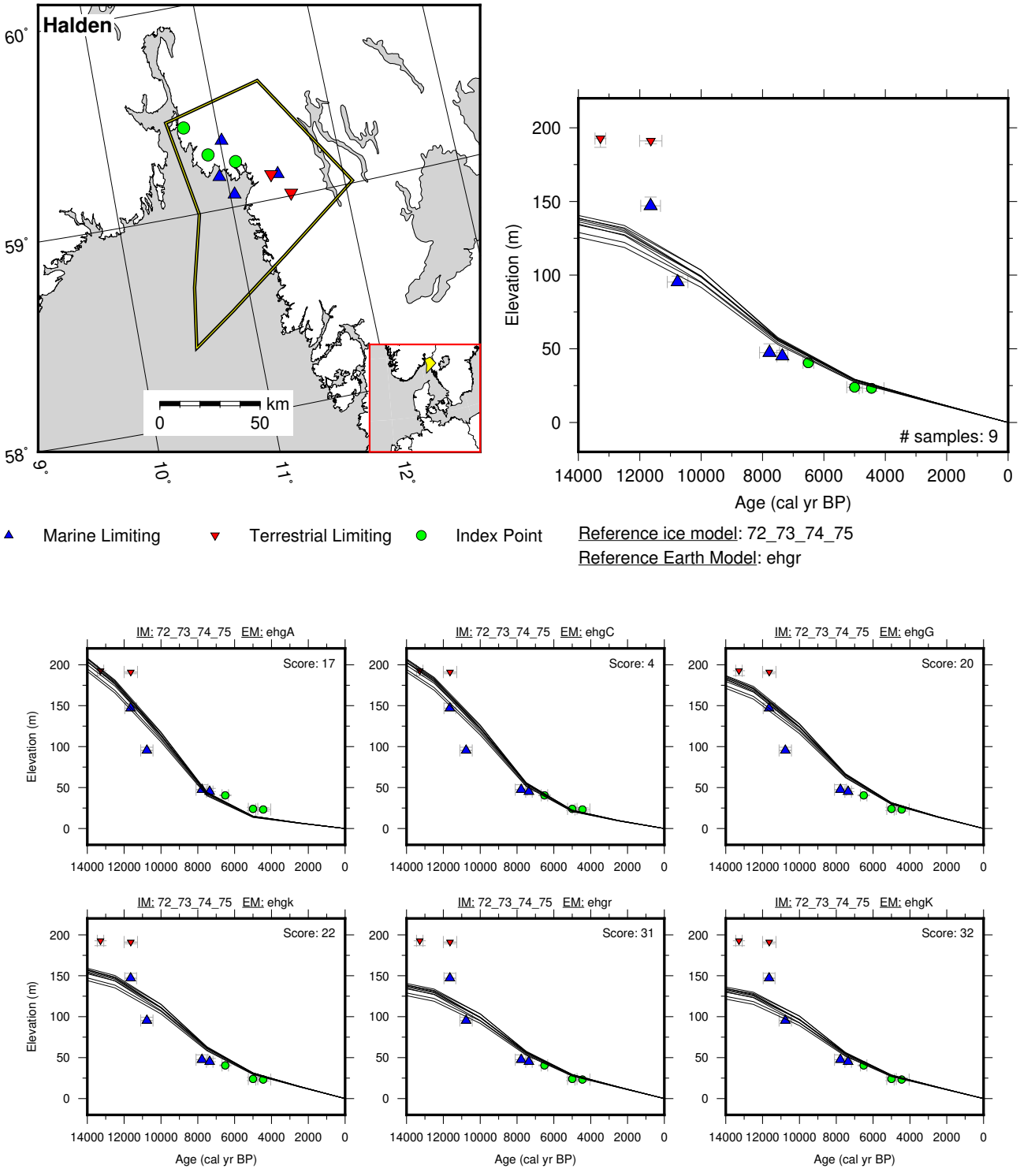


Figure 71: Paleo-sea level and comparison of six models for subregion Danish straits - Kattegat - Skagerrak, location Halden.

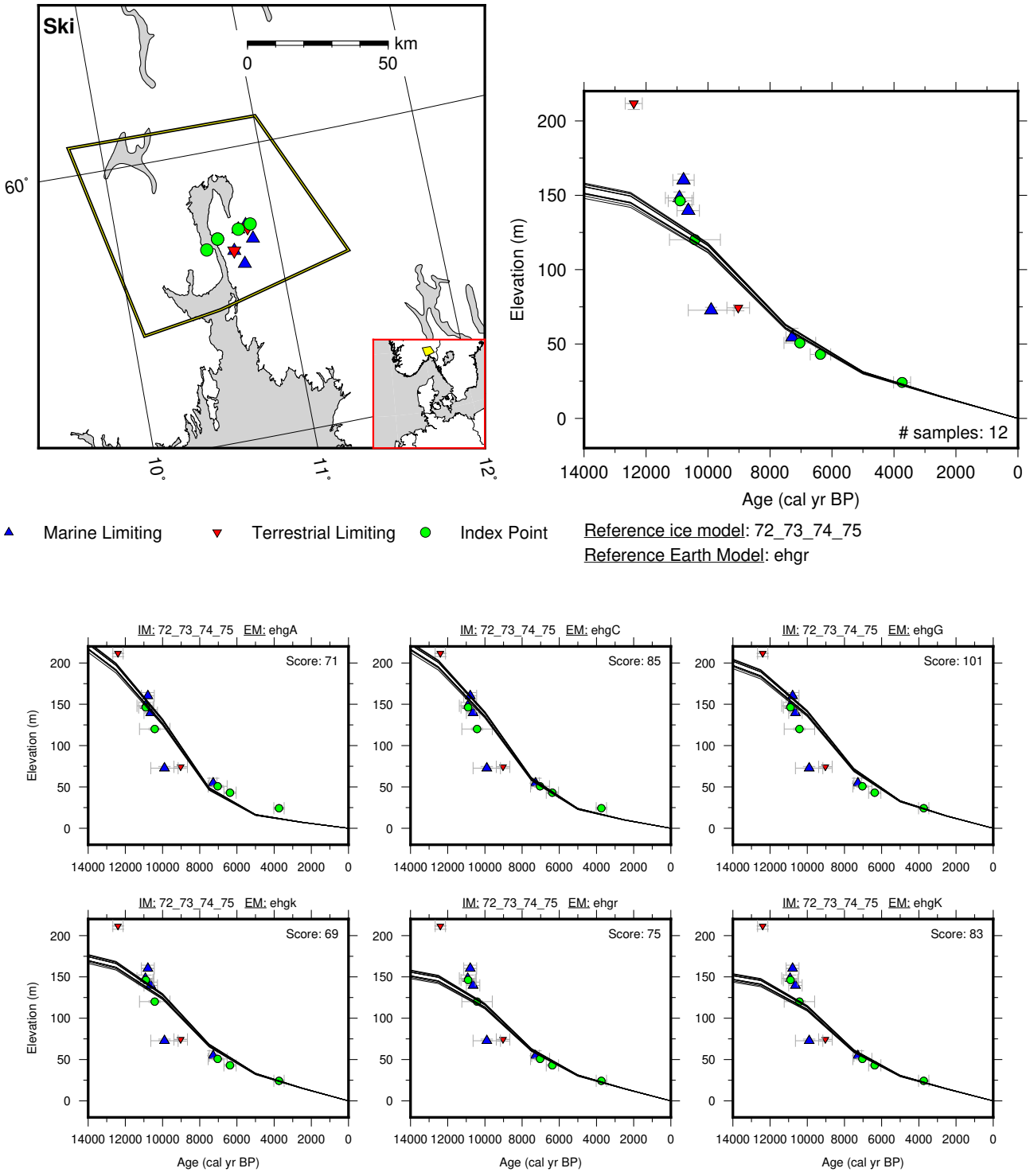


Figure 72: Paleo-sea level and comparison of six models for subregion Danish straits - Kattegat - Skagerrak, location Ski.

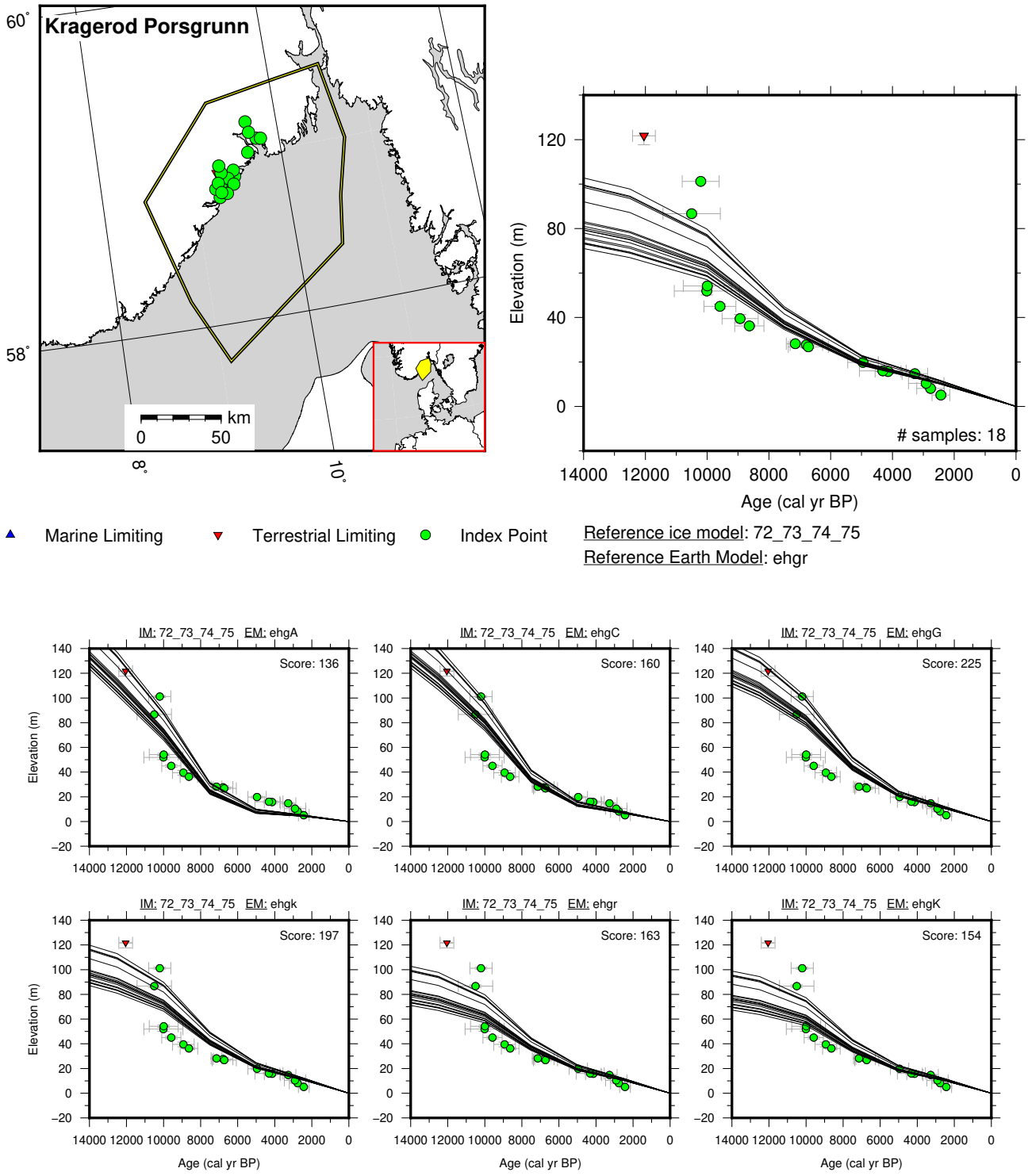


Figure 73: Paleo-sea level and comparison of six models for subregion Danish straits - Kattegat - Skagerrak, location Kragerod Porsgrunn.

8.3 North Sea

References for the data used in each location.

Rotterdam: Berendsen et al. (2007); Hijma and Cohen (2010, 2019); Hijma et al. (2009); Jelgersma (1961); Kiden (1995); Slupik et al. (2013); van de Plassche (1982, 1995); van Heteren et al. (2002); Vos (1992, 2013); Vos and Cohen (2014); Vos et al. (2010, 2011, 2015); **?**

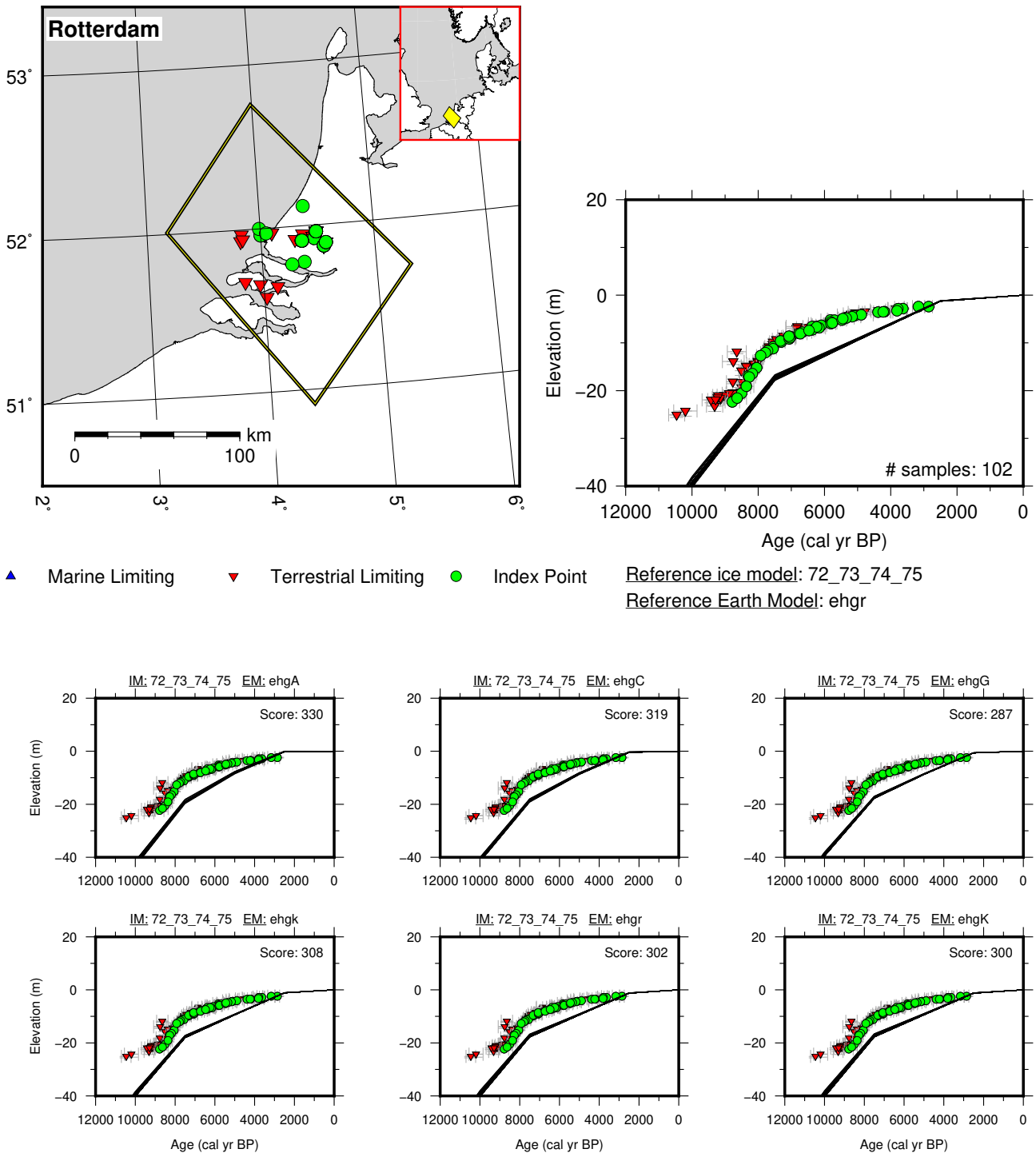


Figure 74: Paleo-sea level and comparison of six models for subregion North Sea, location Rotterdam.

8.4 Western Norway

References for the data used in each location.

Stavanger: Helle (2008); Prøsch-Danielsen (2006); Thomsen (1982)

Sotra: Bondevik et al. (2006); Håkansson (1980); Kaland et al. (1984); Krzywinski and Stabell (1984); Lohne et al. (2007); Stabell and Krzywinski (1978, 1979)

Torvikbygd: Helle (2008); Romundset et al. (2010)

Sula: Bondevik et al. (1997a); Hafsten (1979); Lie et al. (1983); Svendsen and Mangerud (1987)

Bjugn: Bondevik et al. (1997a,b); Kjemperud (1982, 1986)

Frosta: Kjemperud (1981a,b, 1986)

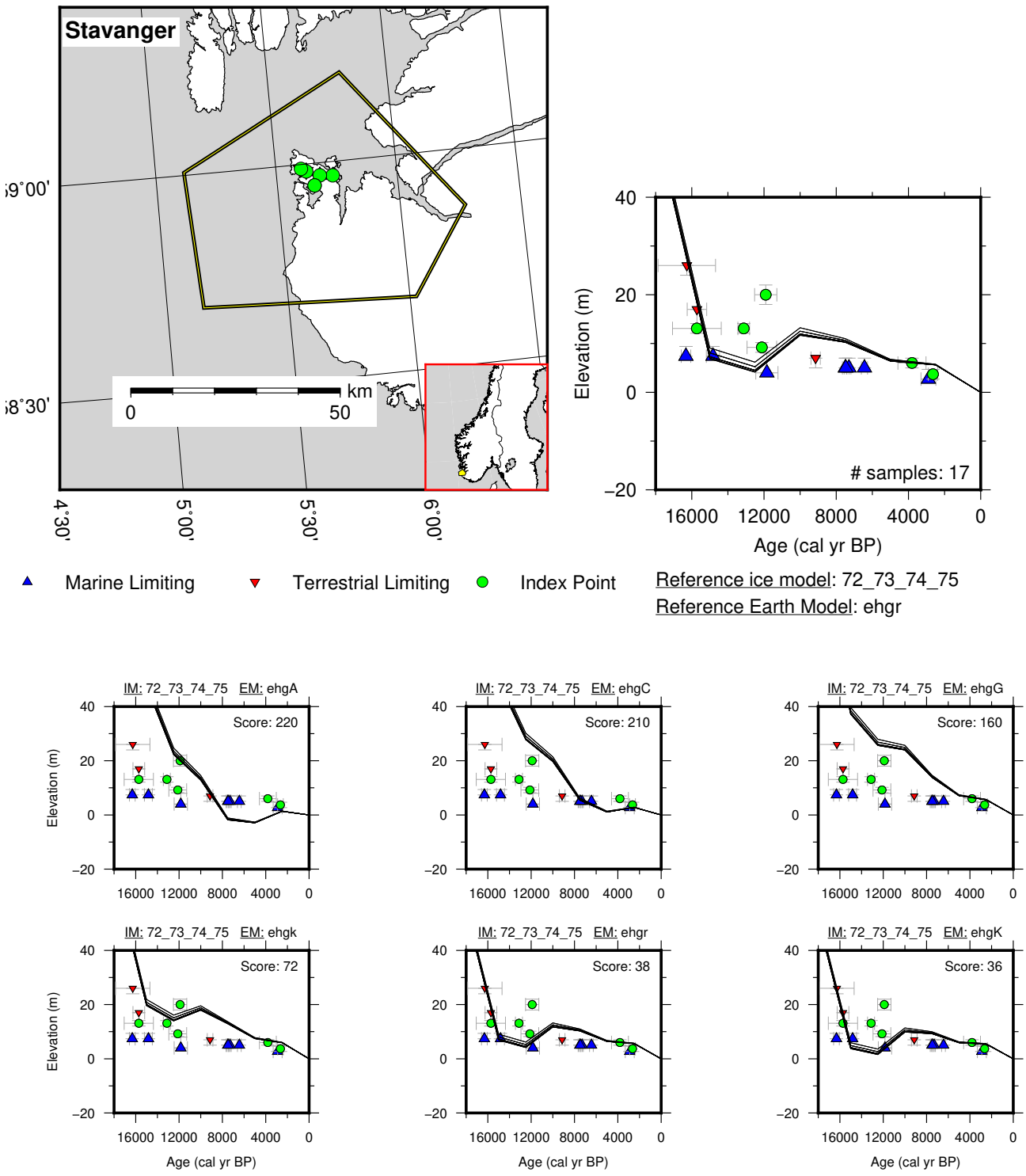


Figure 75: Paleo-sea level and comparison of six models for subregion Western Norway, location Stavanger.

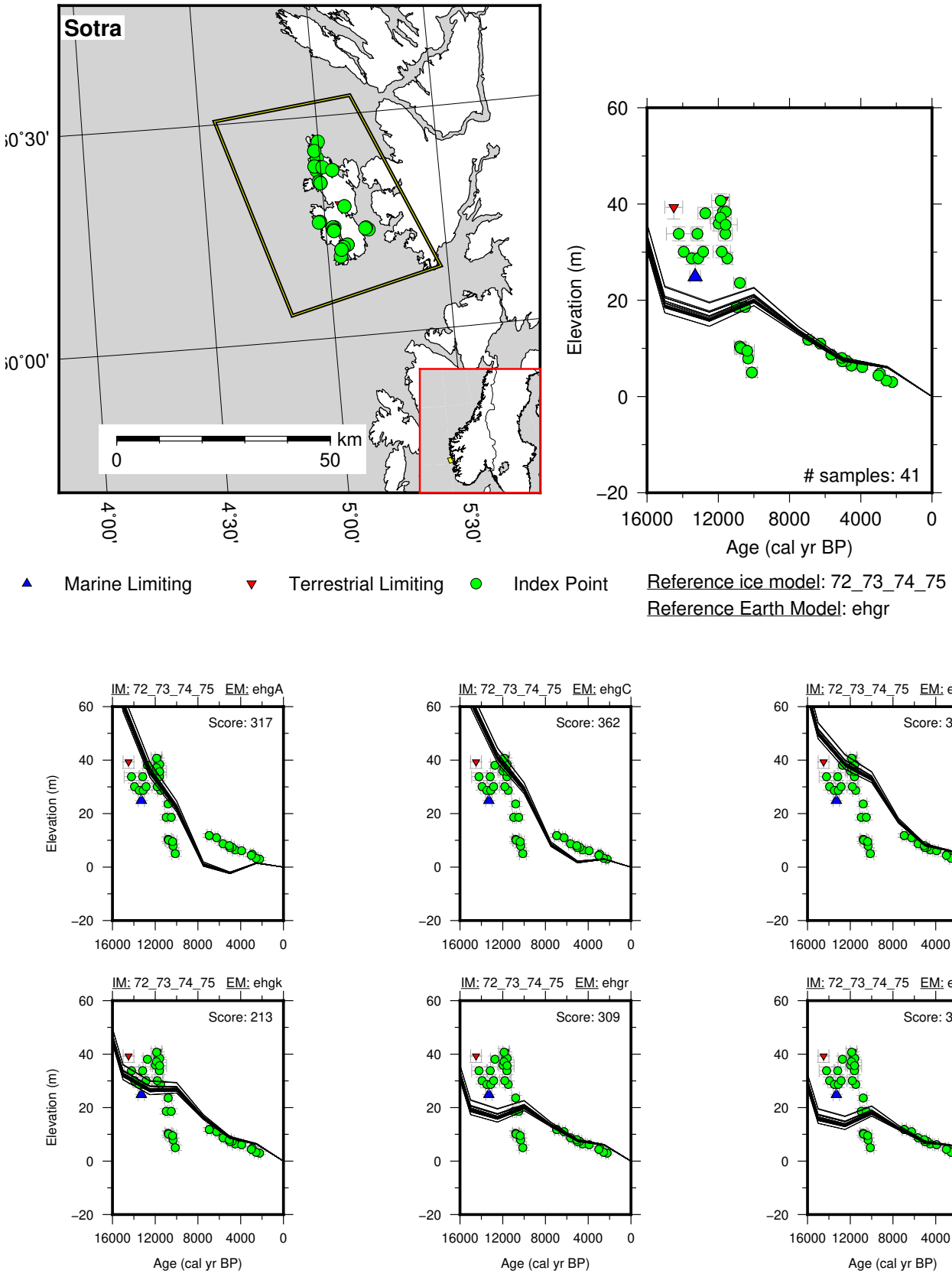


Figure 76: Paleo-sea level and comparison of six models for subregion Western Norway, location Sotra.

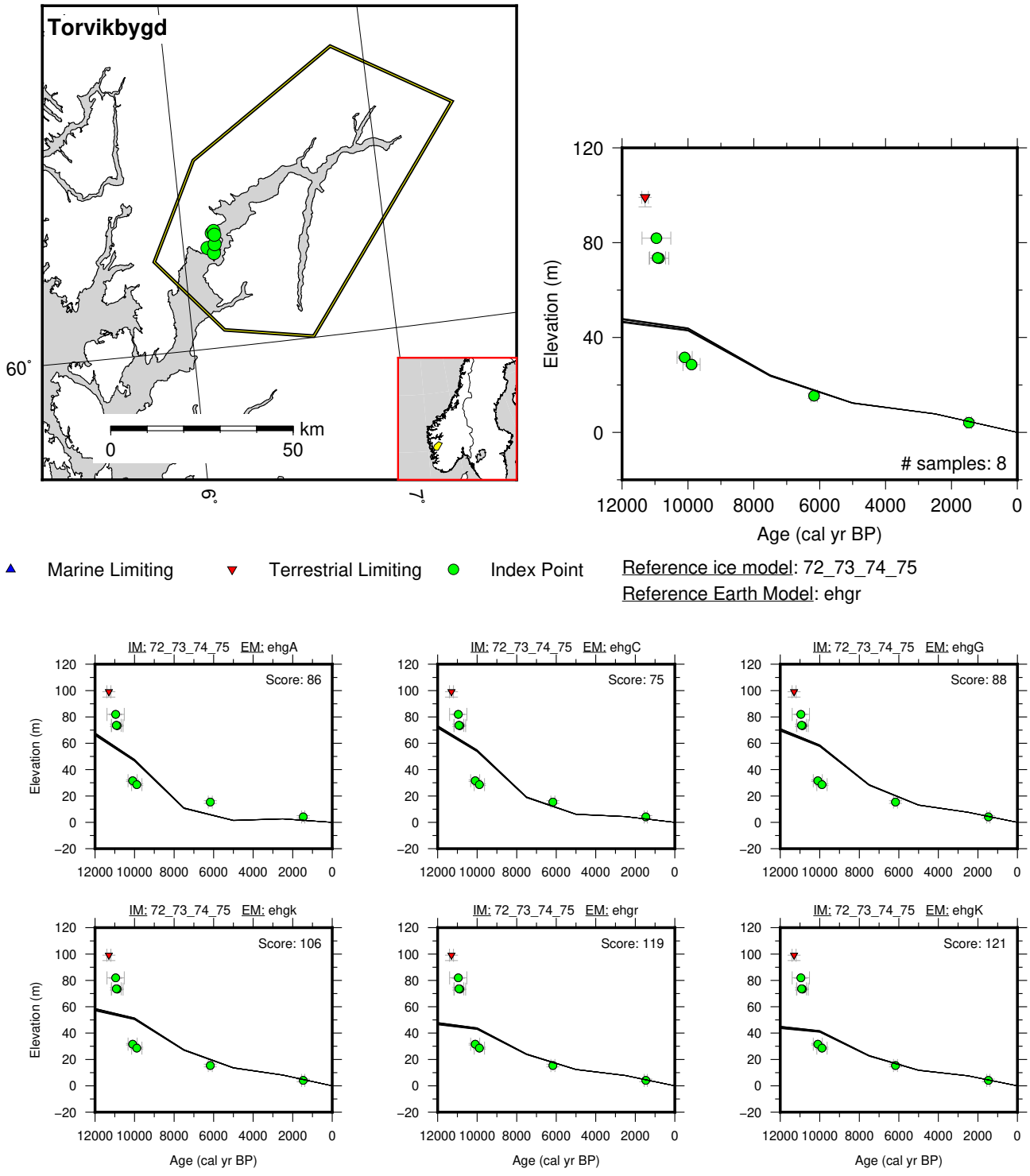
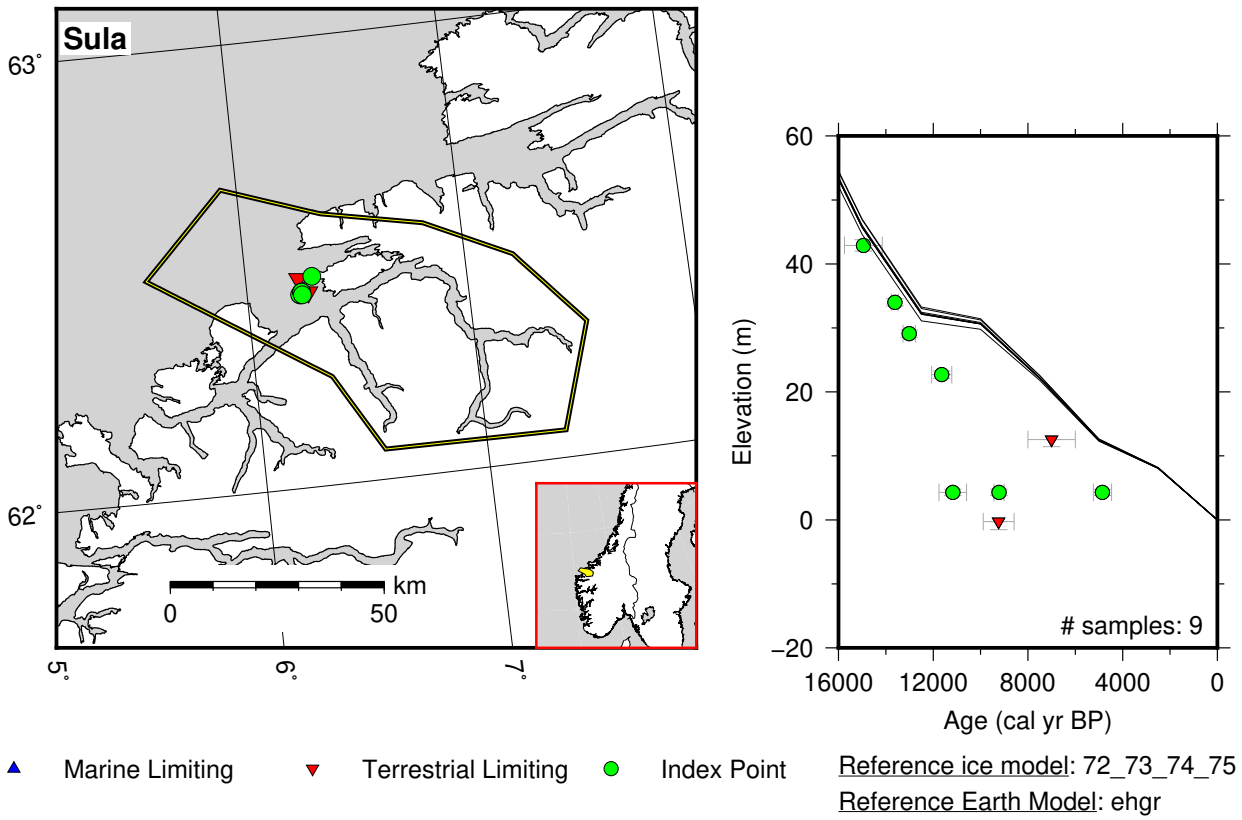


Figure 77: Paleo-sea level and comparison of six models for subregion Western Norway, location Torvikbygd.



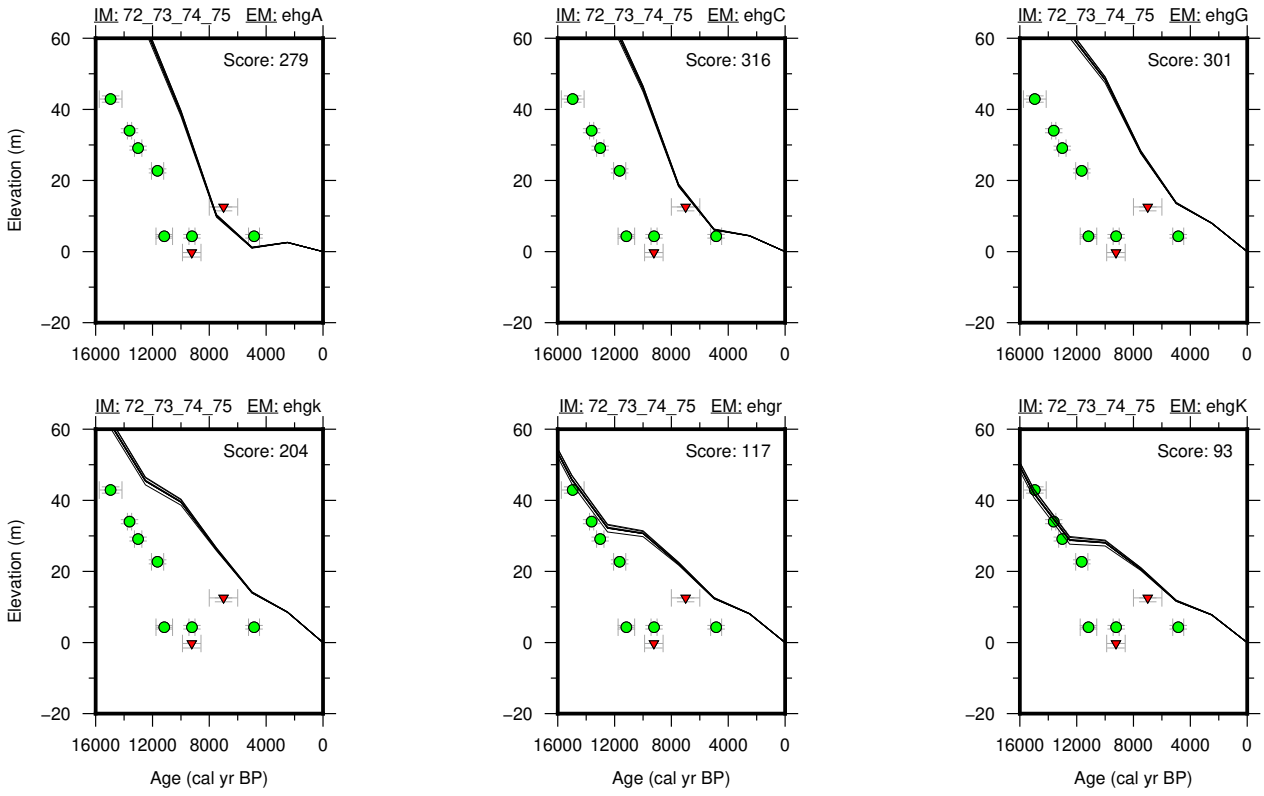


Figure 78: Paleo-sea level and comparison of six models for subregion Western Norway, location Sula.

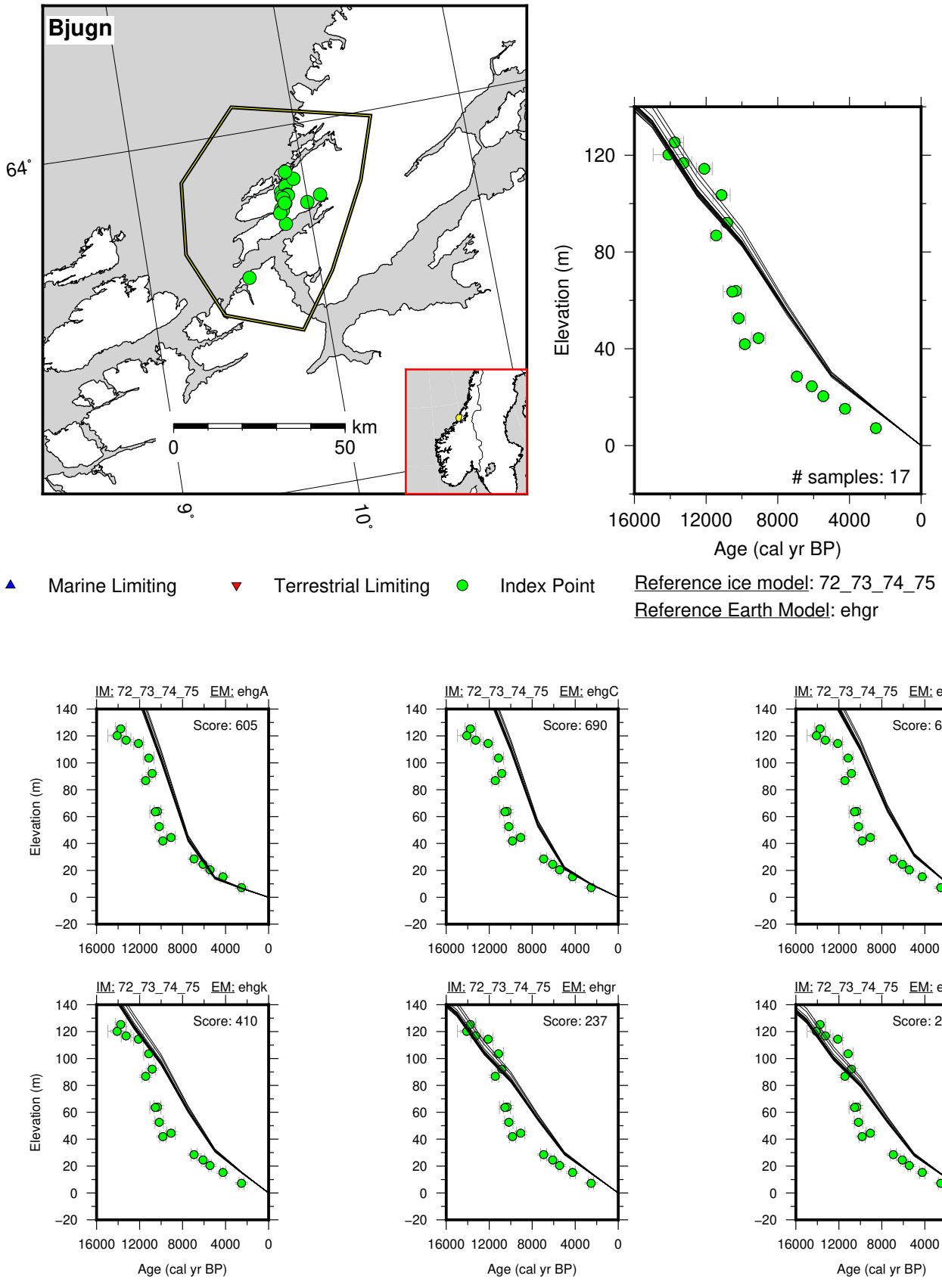
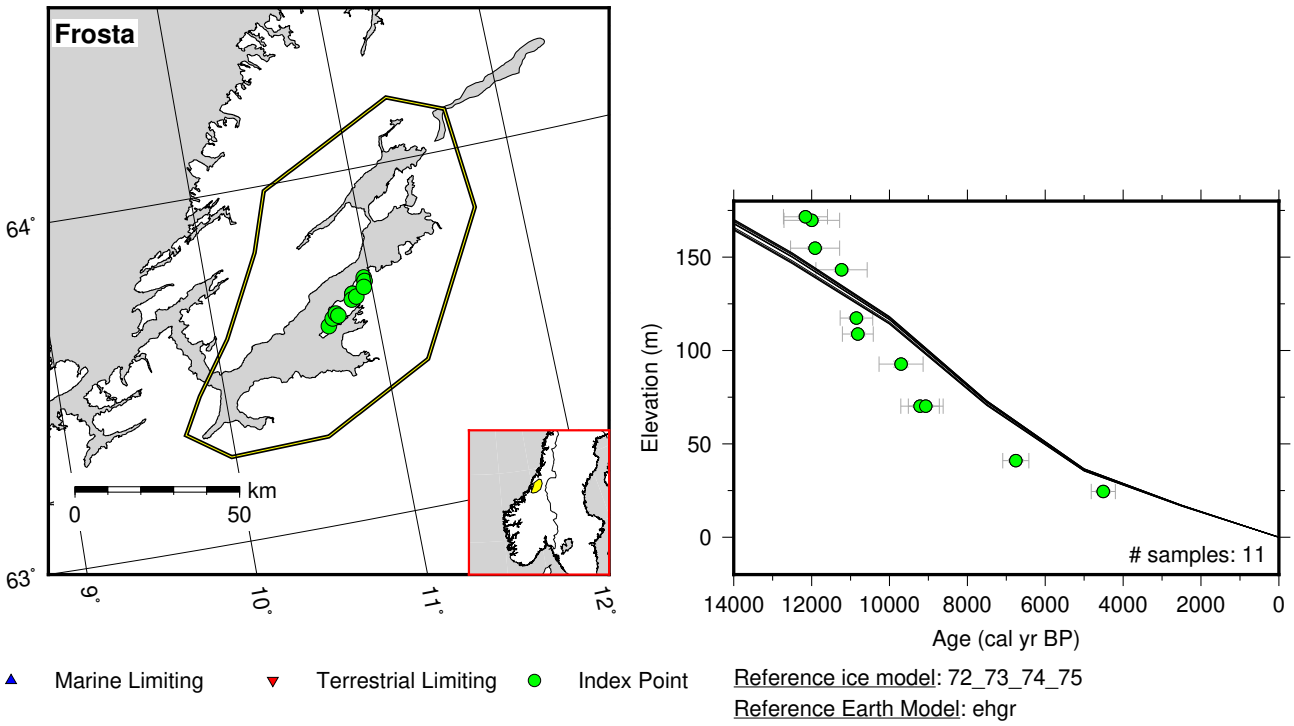


Figure 79: Paleo-sea level and comparison of six models for subregion Western Norway, location Bjugn.



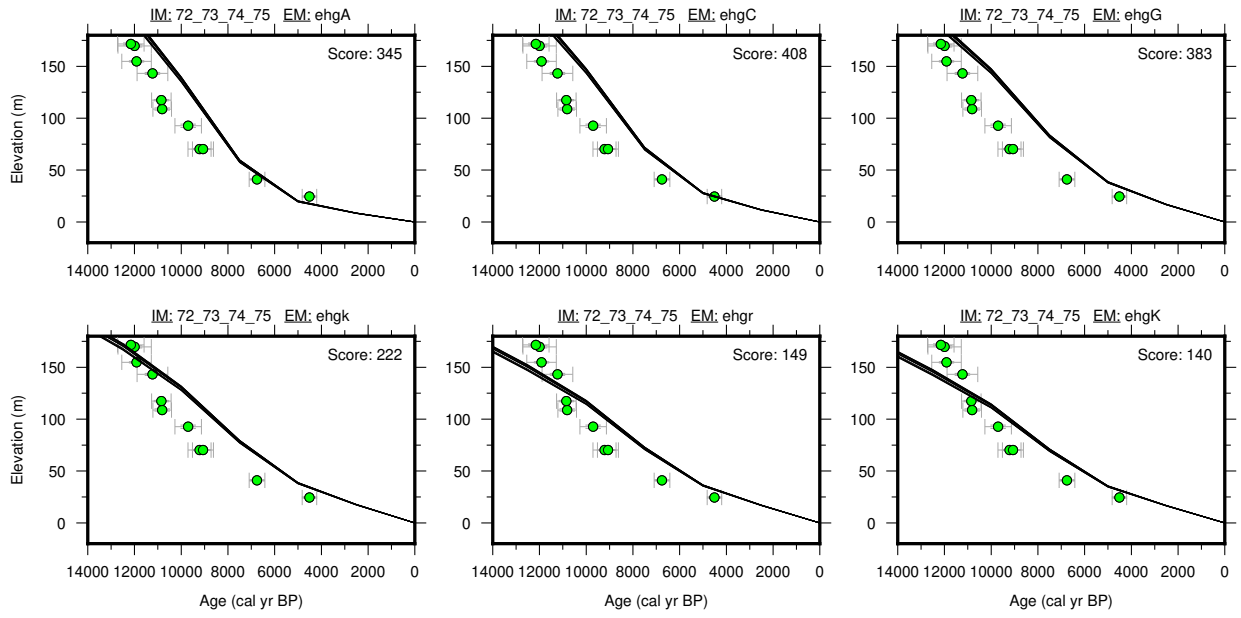


Figure 80: Paleo-sea level and comparison of six models for subregion Western Norway, location Frosta.

9 French Polynesia

9.1 French Polynesia

References for the data used in each location.

Mururoa: Camoin et al. (2001)

Tahiti: Bard et al. (1996, 2010); Deschamps et al. (2012); Thomas et al. (2009)

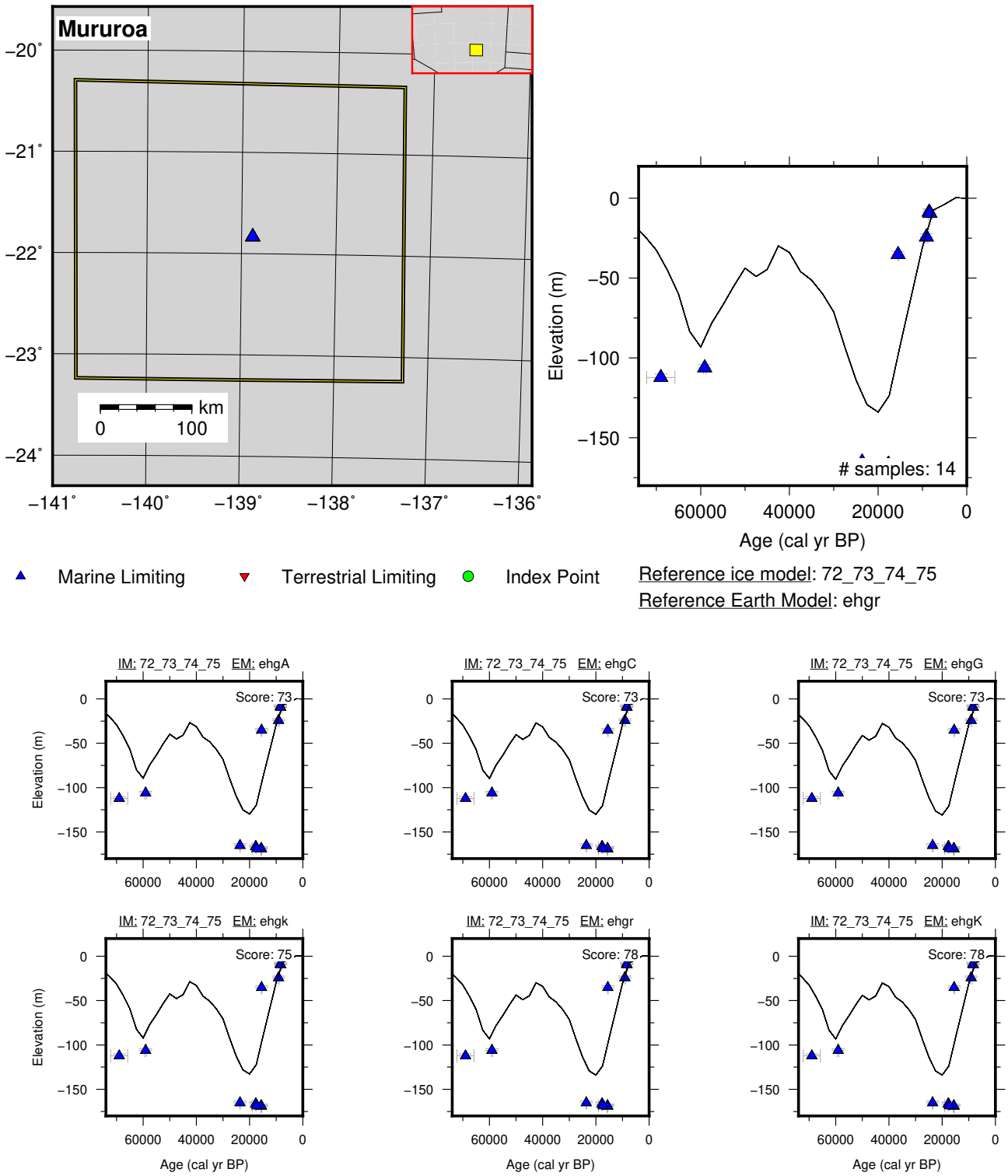


Figure 81: Paleo-sea level and comparison of six models for subregion French Polynesia, location Mururoa.

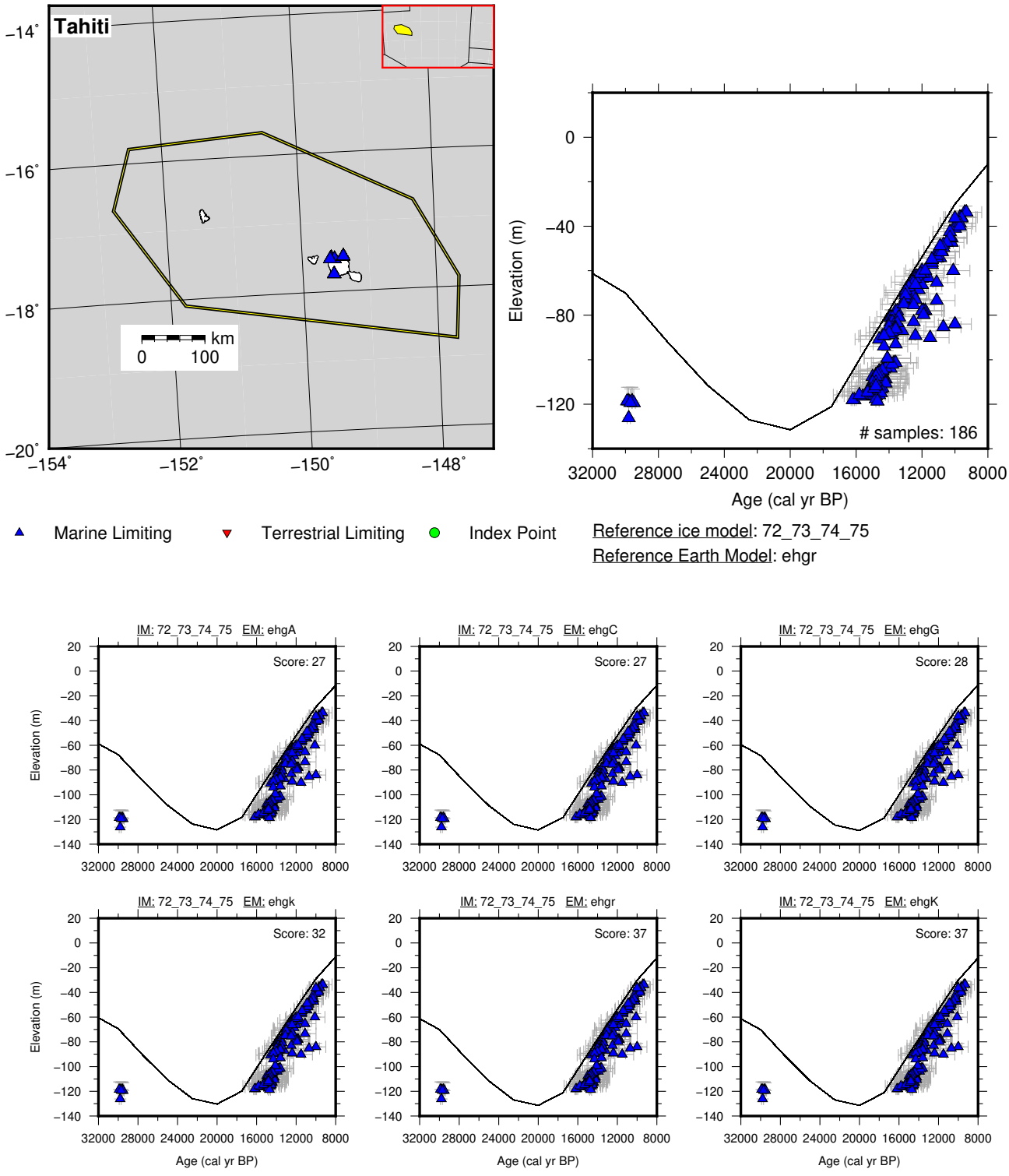


Figure 82: Paleo-sea level and comparison of six models for subregion French Polynesia, location Tahiti.

10 MIS 3 - MIS 4

10.1 Eastern United States (MIS3 - MIS4)

References for the data used in each location.

US Mid Atlantic: Best (2010); Cronin et al. (1981); Culver et al. (2011); Mallinson et al. (2008); Mixon et al. (1982); Moore (2009); Parham et al. (2013); Scott (2006)

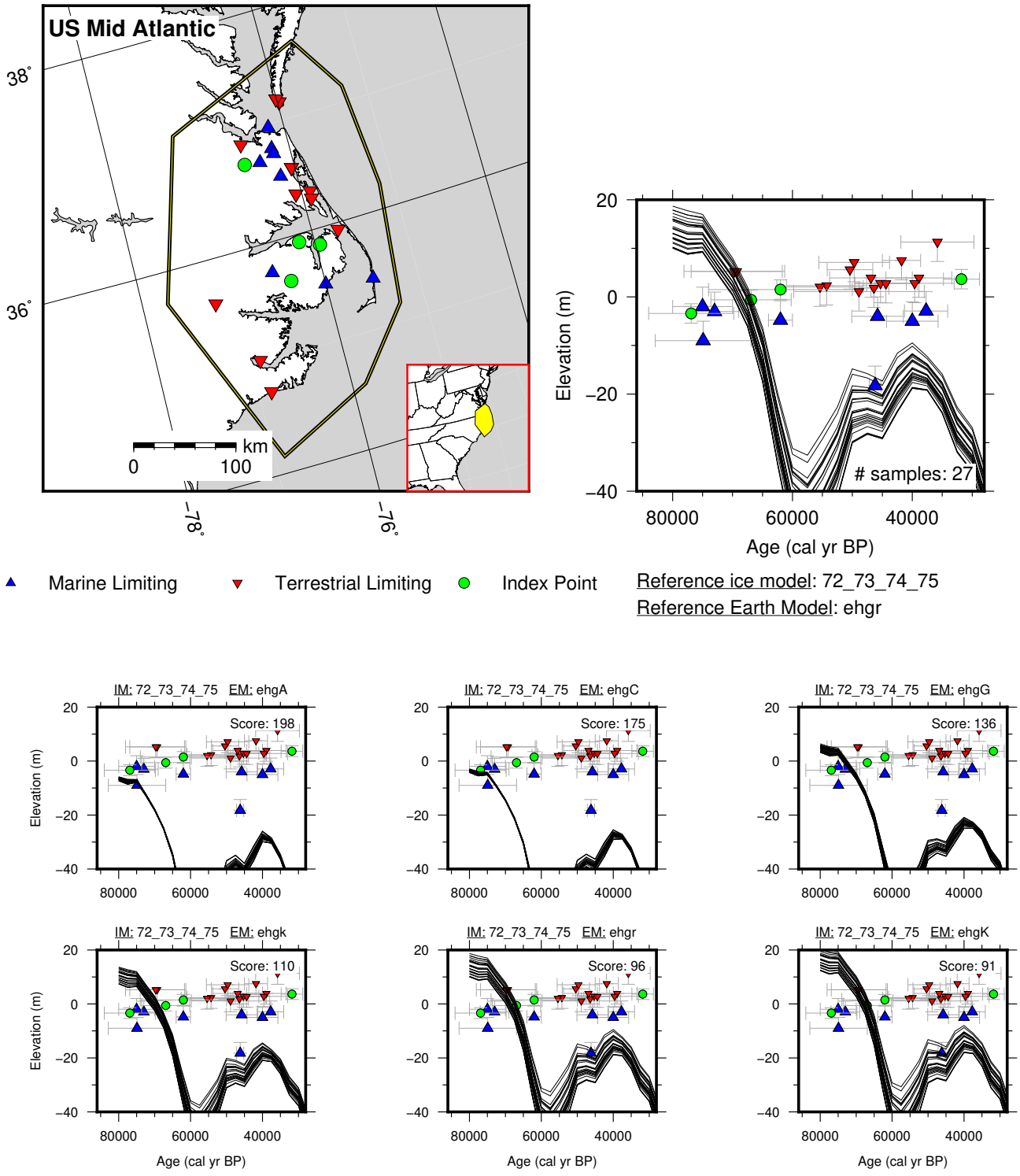


Figure 83: Paleo-sea level and comparison of six models for subregion Eastern United States (MIS3 - MIS4), location US Mid Atlantic.

10.2 French Polynesia (MIS3 - MIS4)

References for the data used in each location.

Mururoa: Camoin et al. (2001)

Tahiti: Thomas et al. (2009)

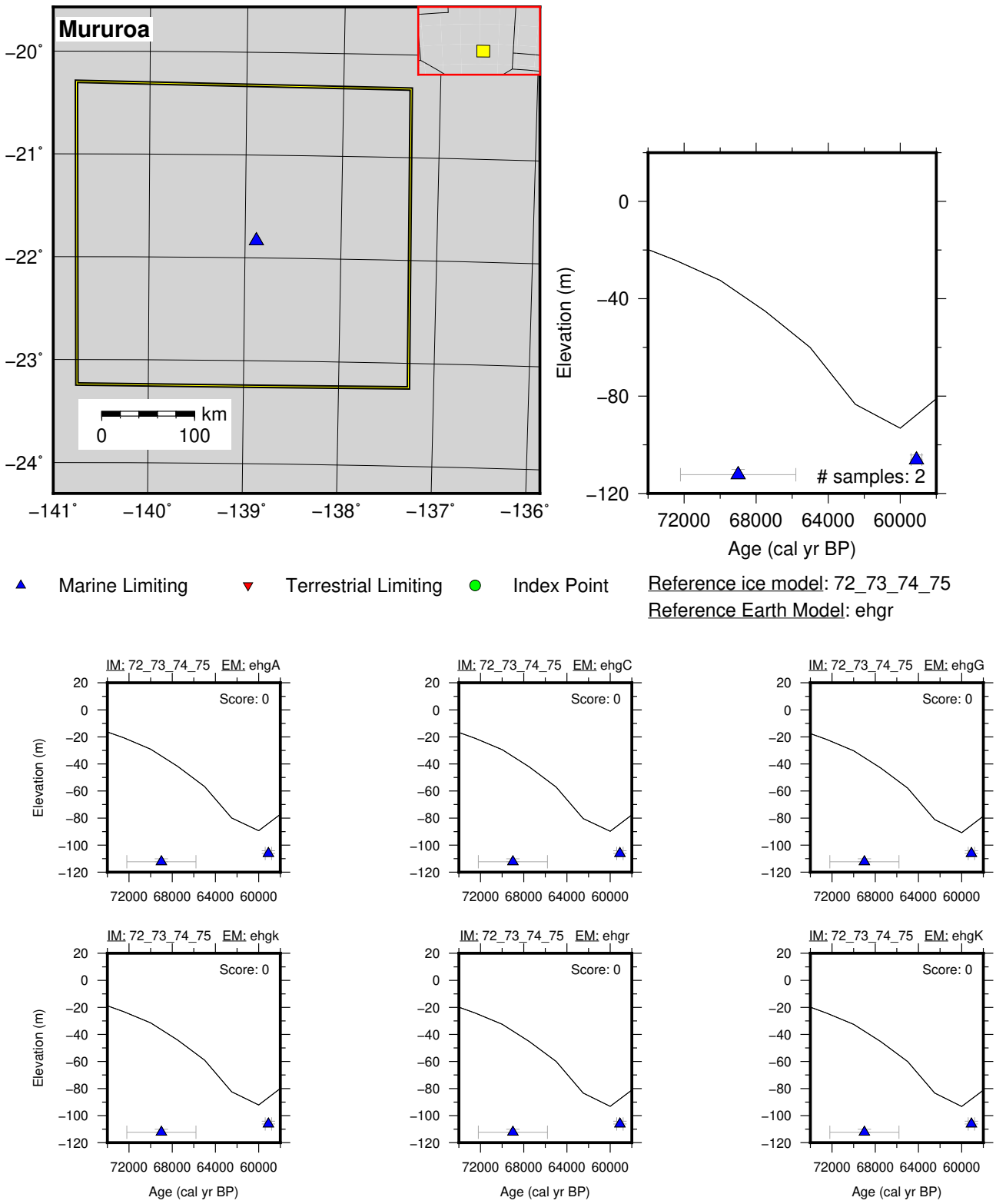


Figure 84: Paleo-sea level and comparison of six models for subregion French Polynesia (MIS3 - MIS4), location Mururoa.

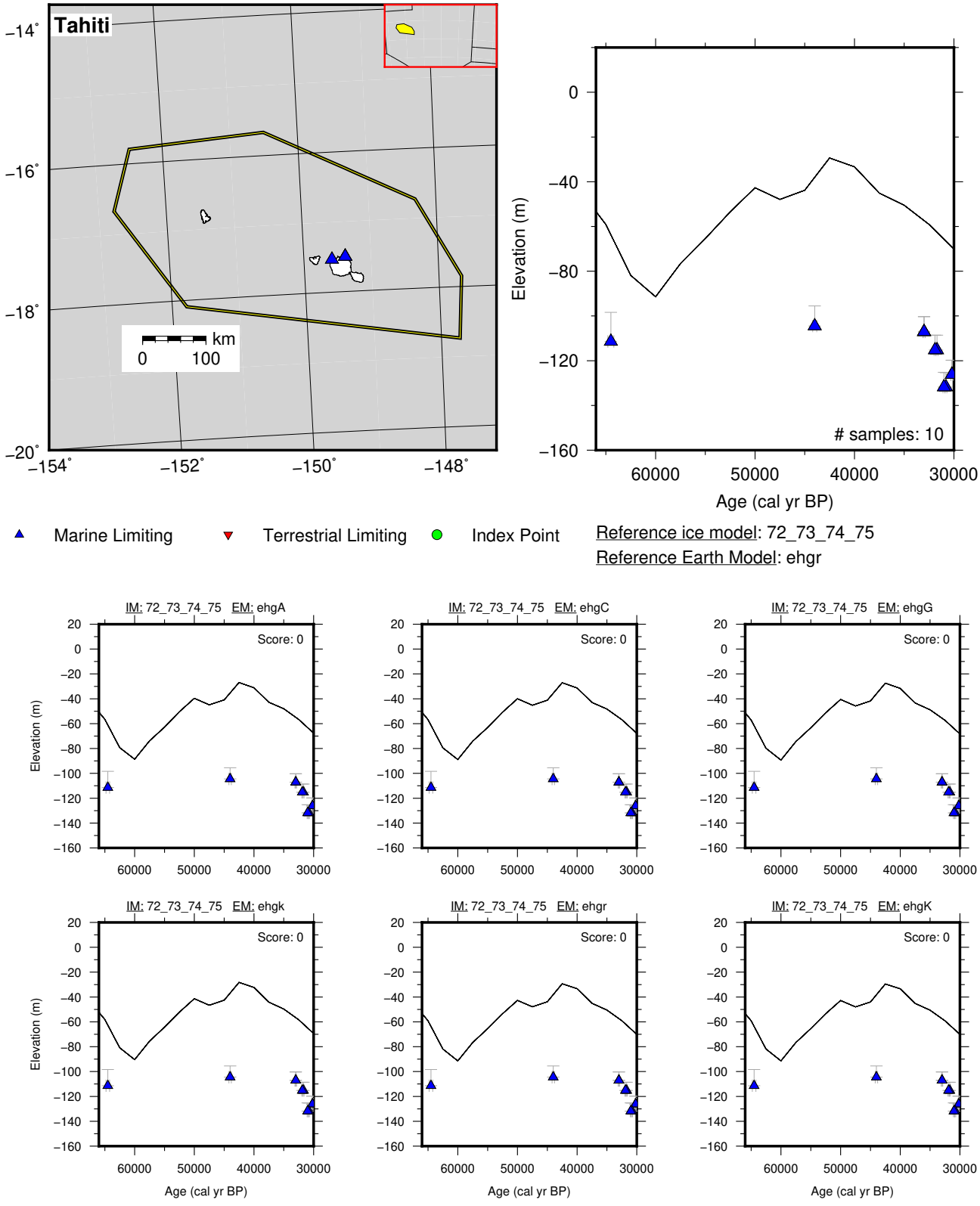


Figure 85: Paleo-sea level and comparison of six models for subregion French Polynesia (MIS3 - MIS4), location Tahiti.

10.3 Northeastern Australia (MIS3 - MIS4)

References for the data used in each location.

Cairns: Yokoyama et al. (2018)

Mackay: Yokoyama et al. (2018)

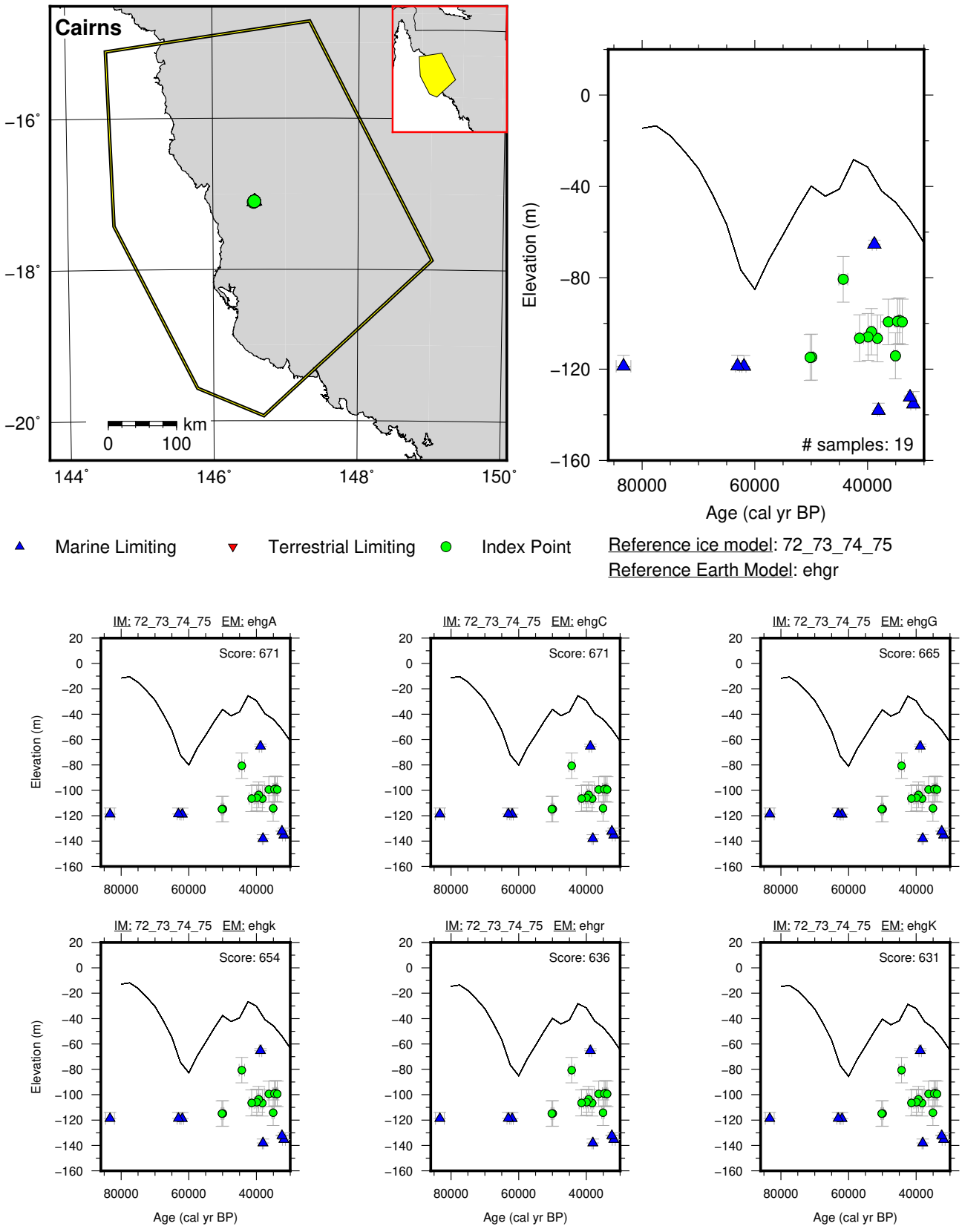


Figure 86: Paleo-sea level and comparison of six models for subregion Northeastern Australia (MIS3 - MIS4), location Cairns.

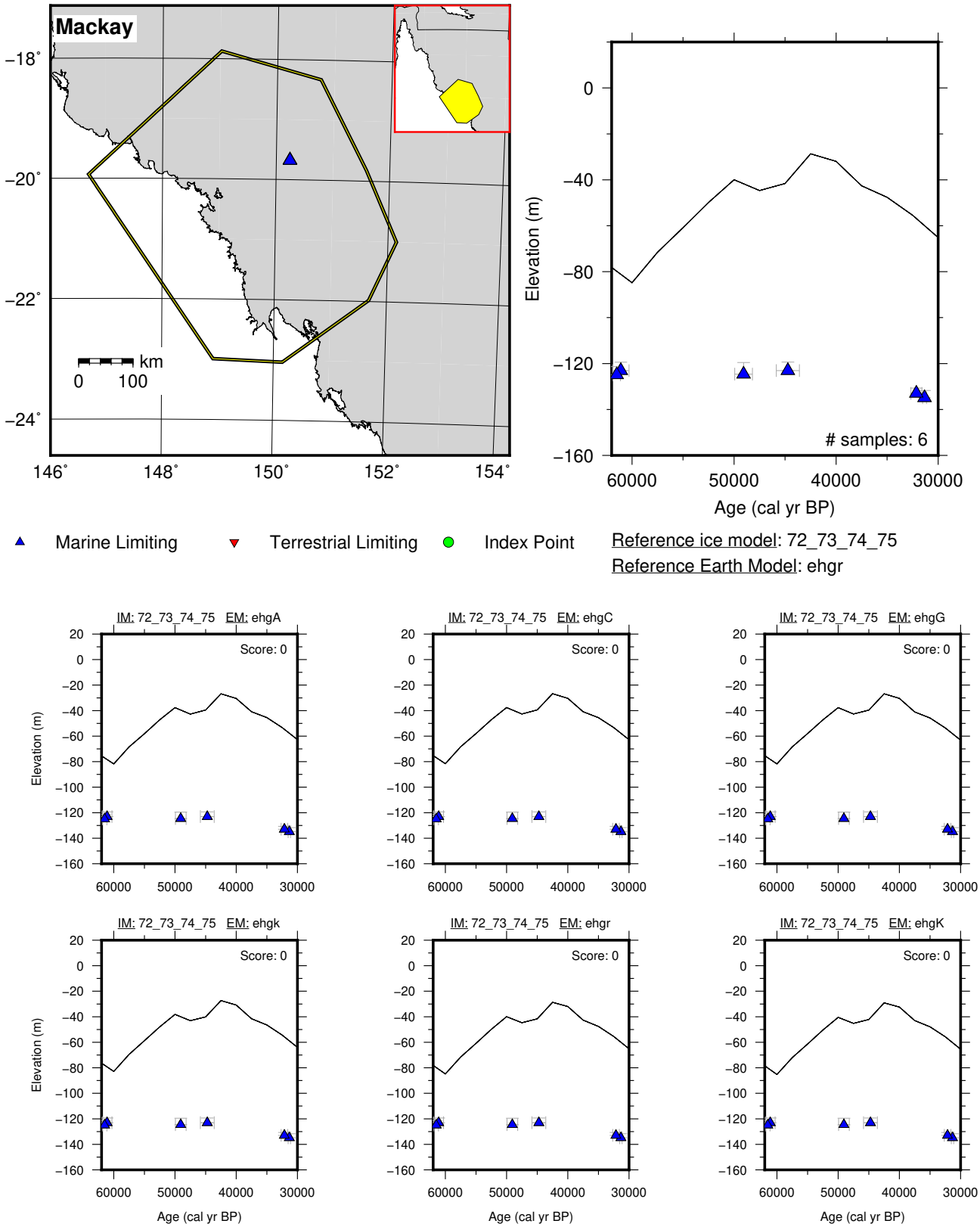


Figure 87: Paleo-sea level and comparison of six models for subregion Northeastern Australia (MIS3 - MIS4), location Mackay.

10.4 Papua New Guinea (MIS3 - MIS4)

References for the data used in each location.

Huon Peninsula: Chappell et al. (1996); Cutler et al. (2003); Hibbert et al. (2016); Yokoyama et al. (2001)

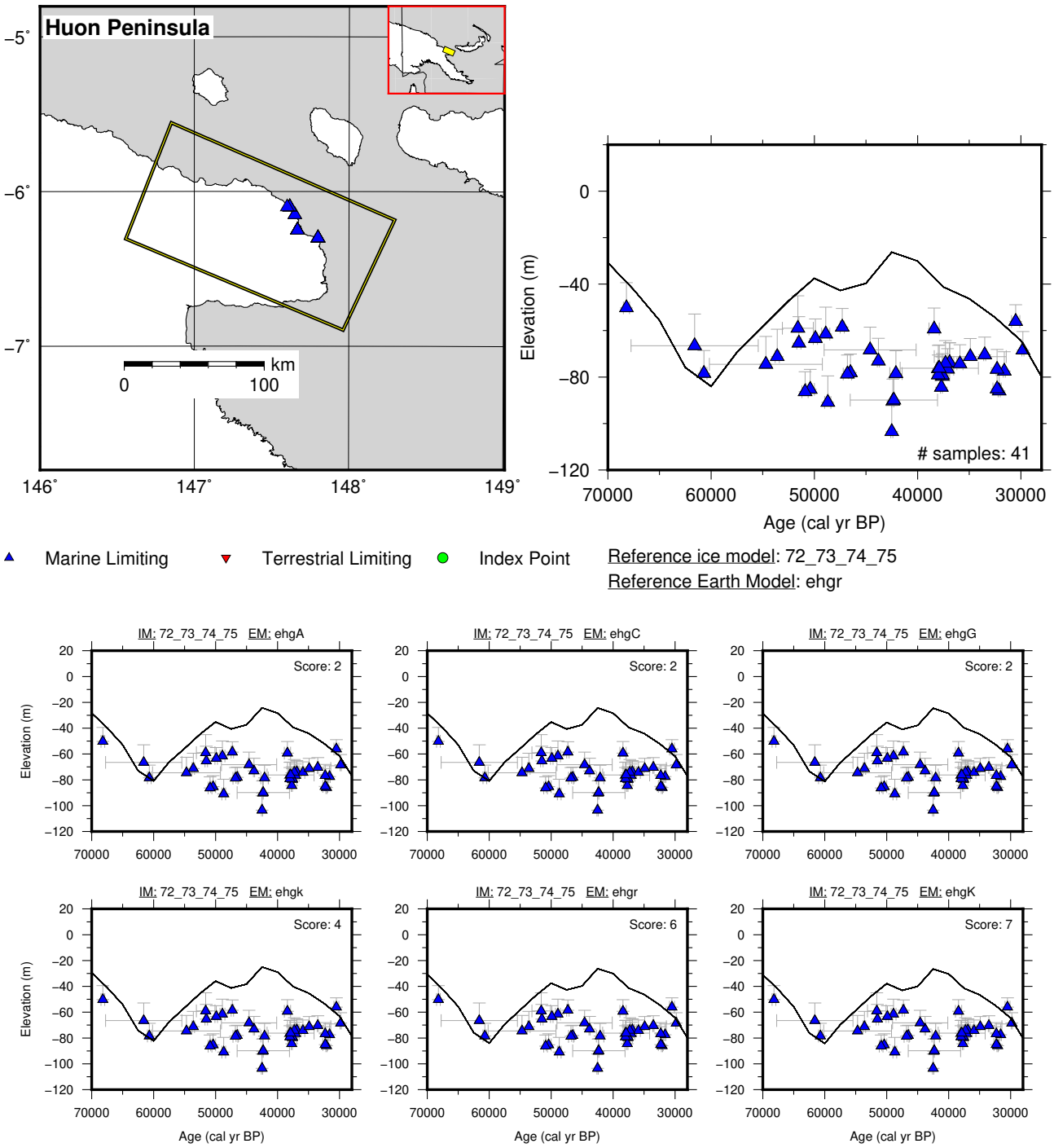


Figure 88: Paleo-sea level and comparison of six models for subregion Papua New Guinea (MIS3 - MIS4), location Huon Peninsula.

10.5 Sundaland (MIS3 - MIS4)

References for the data used in each location.

Sunda Shelf: Hanebuth et al. (2003); Steinke et al. (2003)

Vietnam Shelf: Schimanski and Stattegger (2005)

Strait Of Malacca: Geyh et al. (1979)

Mekong Delta: Ta et al. (2002)

Chao Phraya: Tanabe et al. (2003)

Berhala Strait: Geyh et al. (1979)

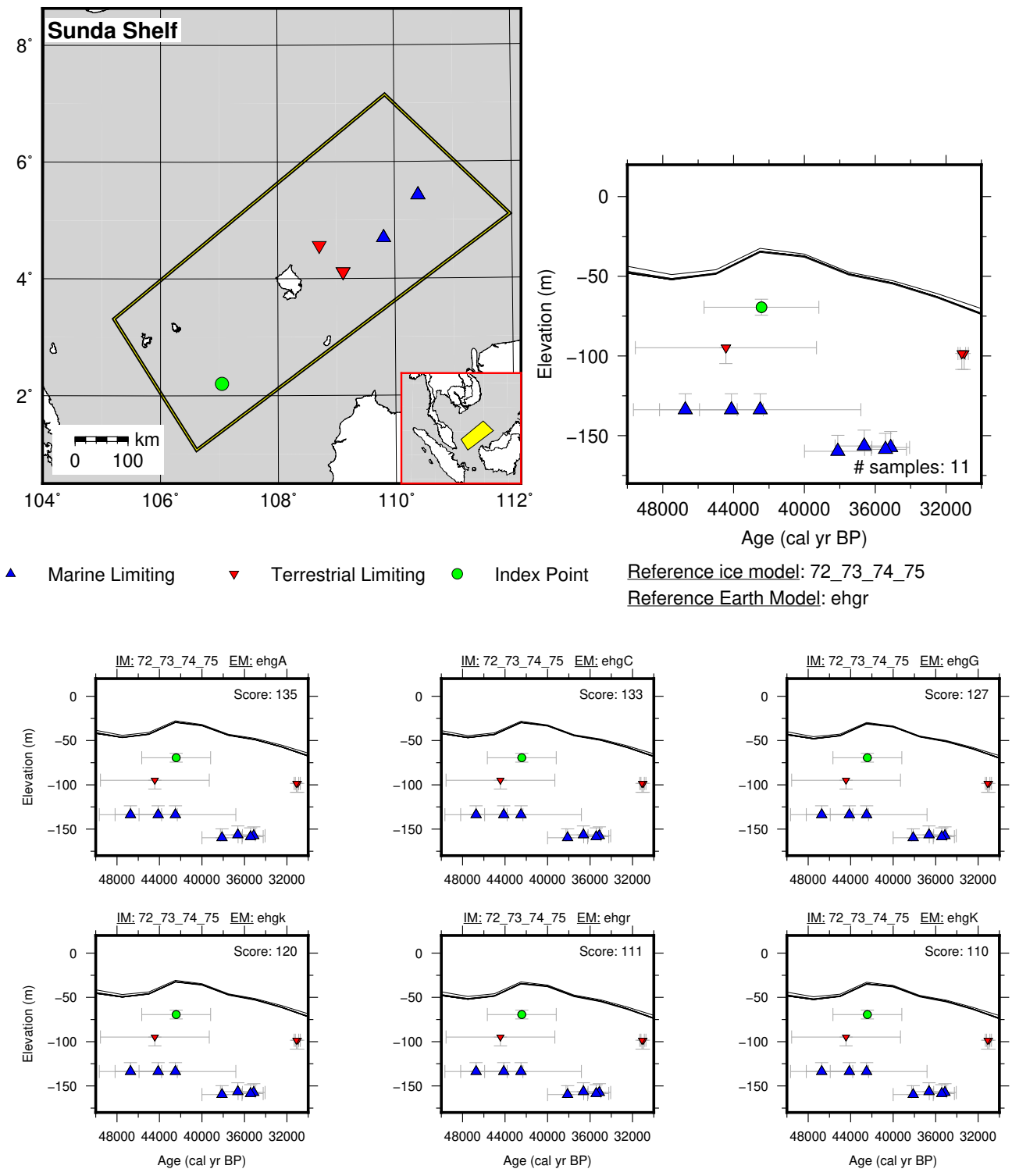


Figure 89: Paleo-sea level and comparison of six models for subregion Sundaland (MIS3 - MIS4), location Sunda Shelf.

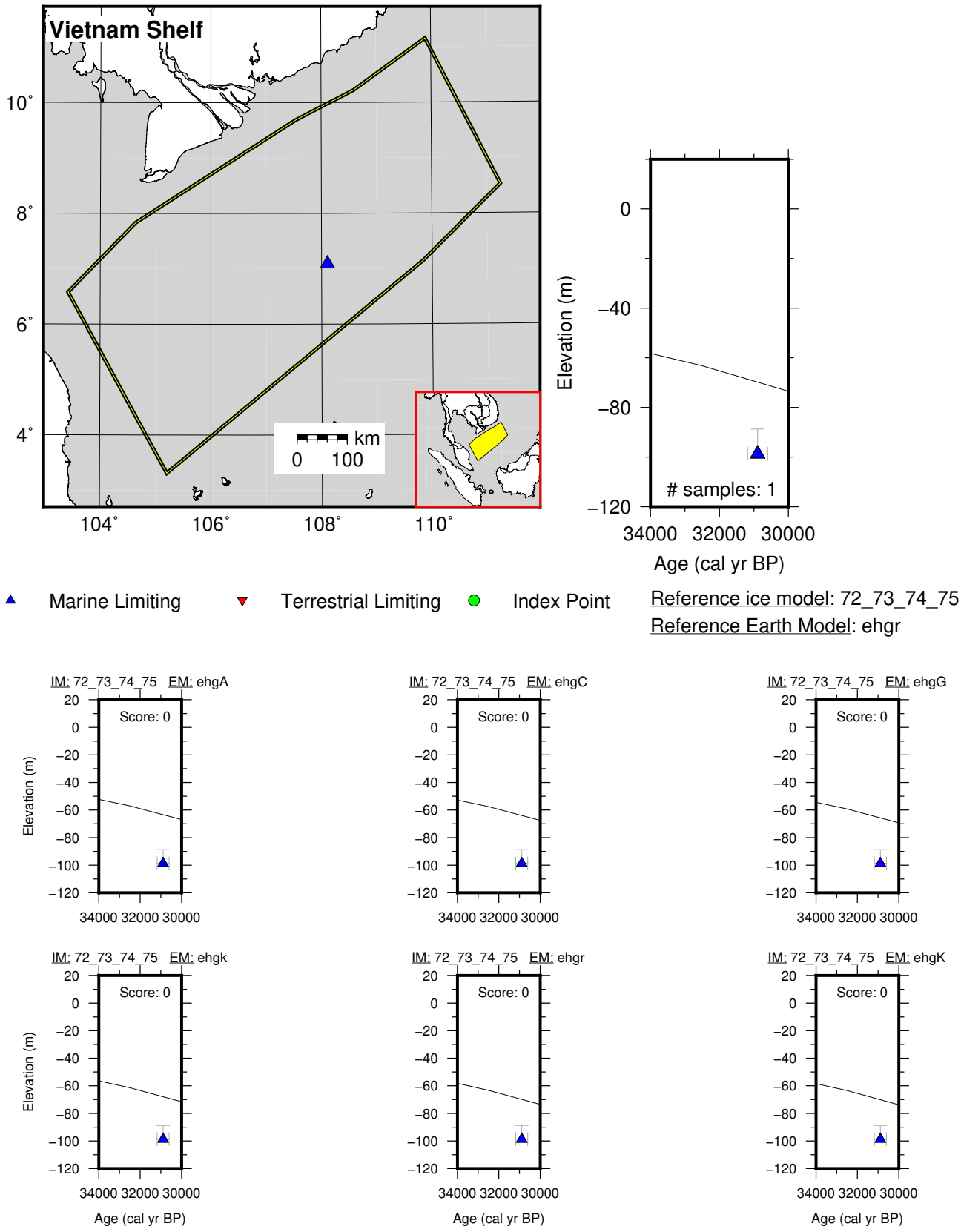


Figure 90: Paleo-sea level and comparison of six models for subregion Sundaland (MIS3 - MIS4), location Vietnam Shelf.

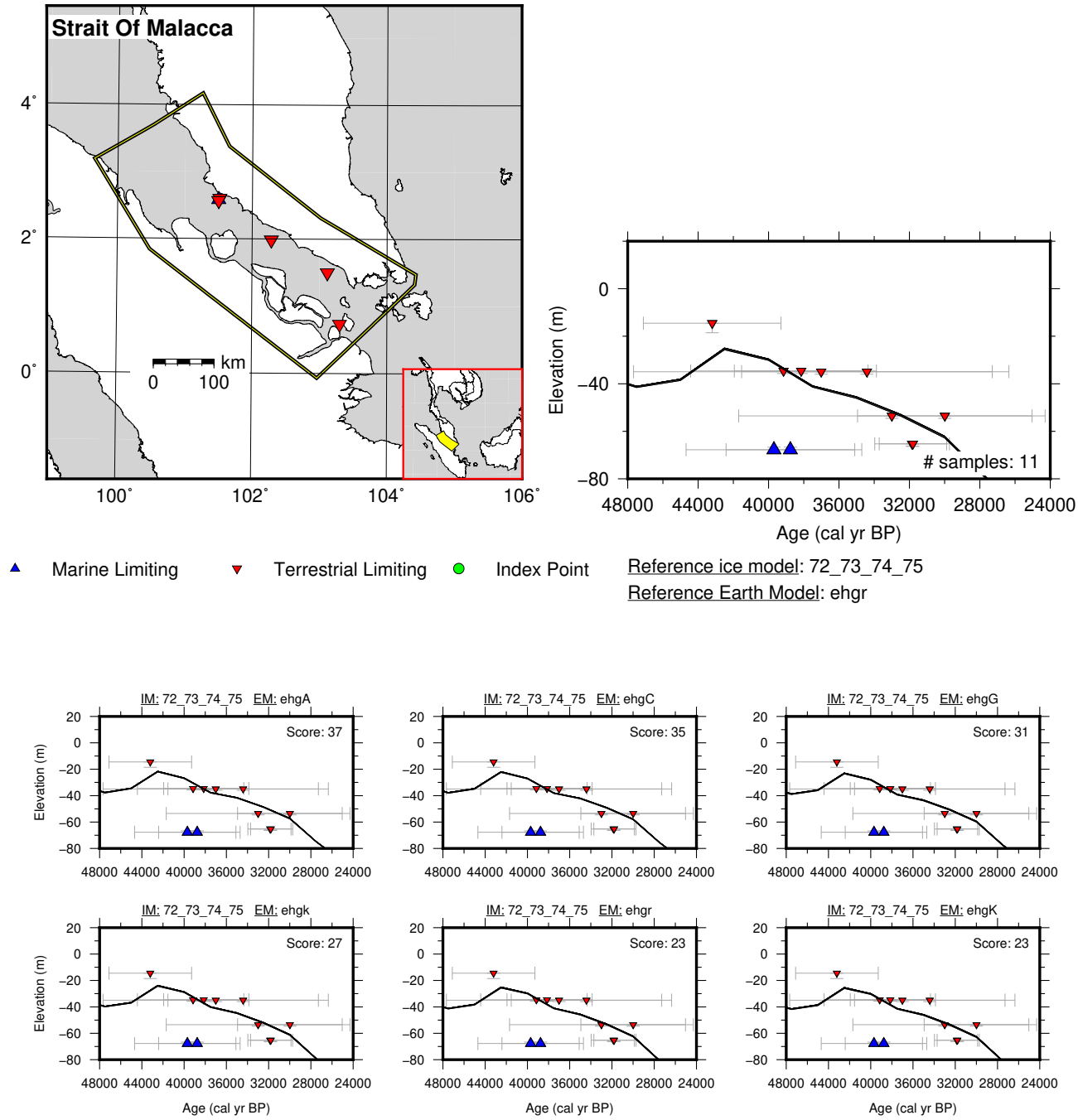
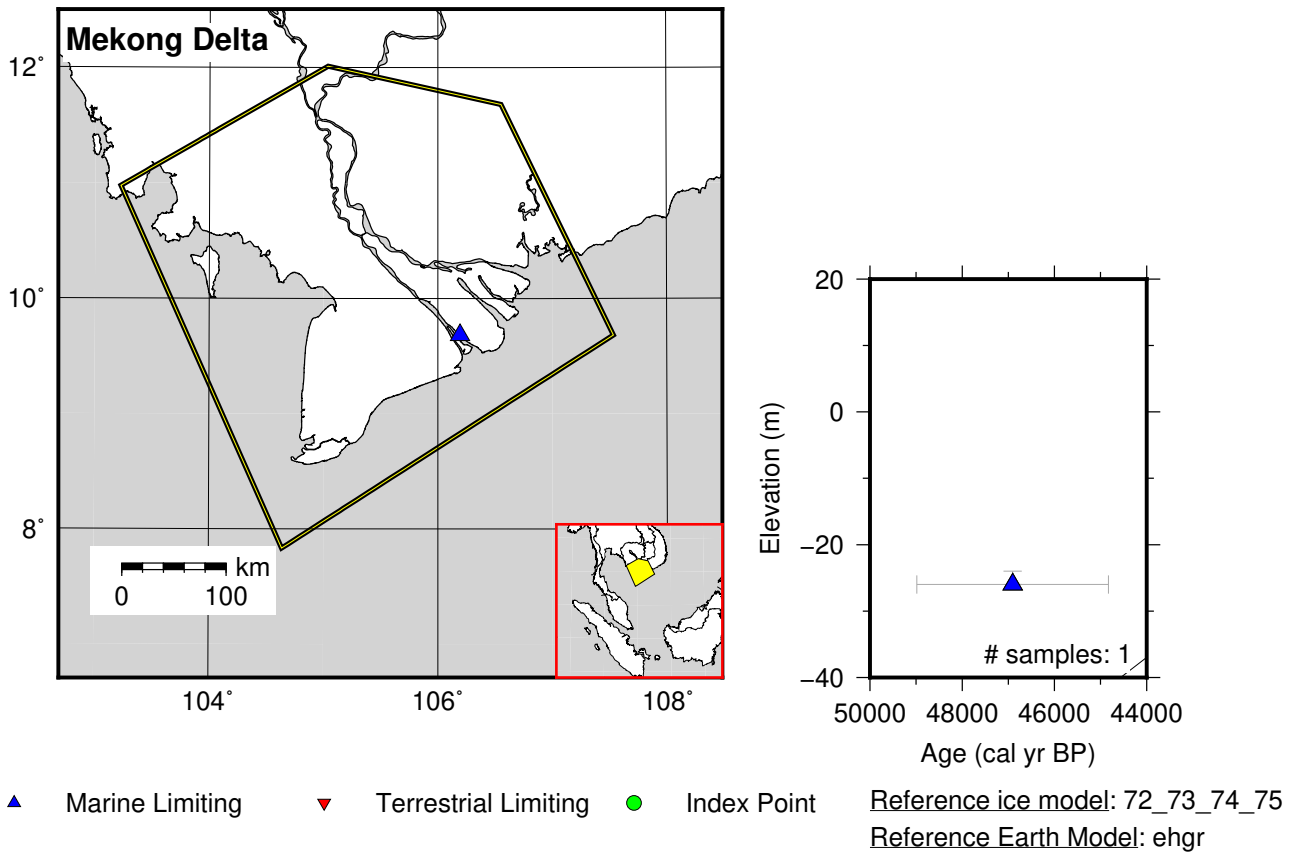


Figure 91: Paleo-sea level and comparison of six models for subregion Sundaland (MIS3 - MIS4), location Strait Of Malacca.



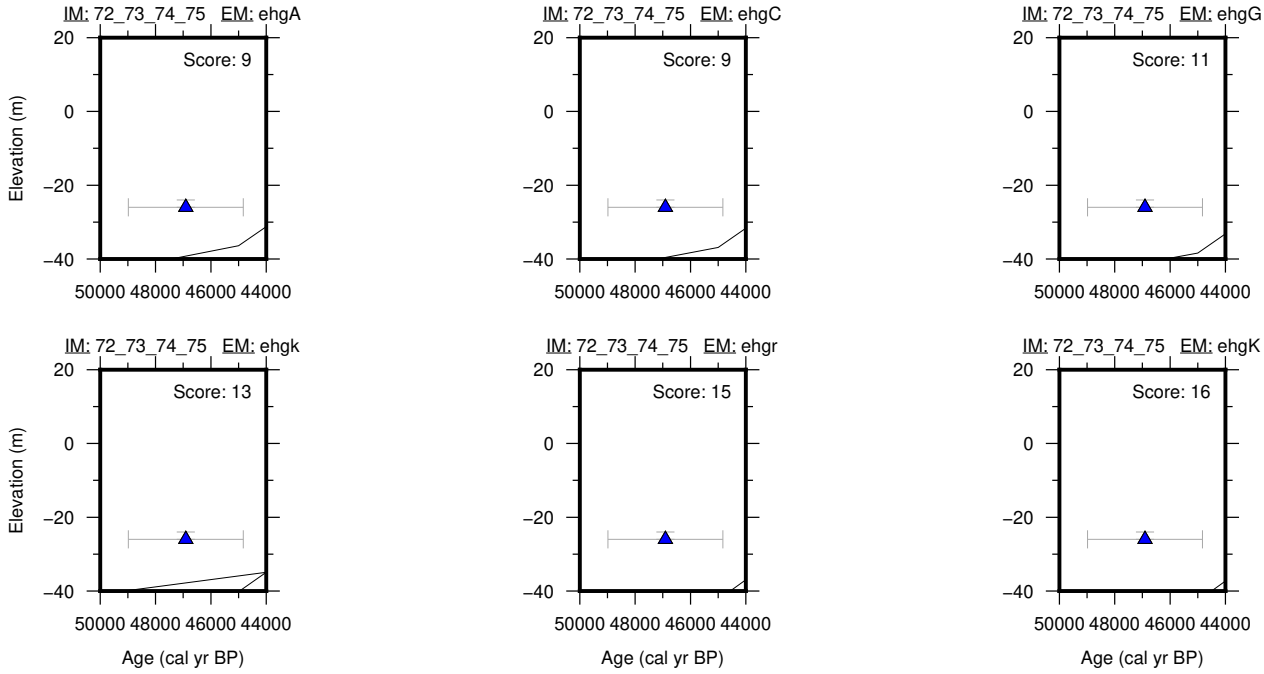


Figure 92: Paleo-sea level and comparison of six models for subregion Sundaland (MIS3 - MIS4), location Mekong Delta.

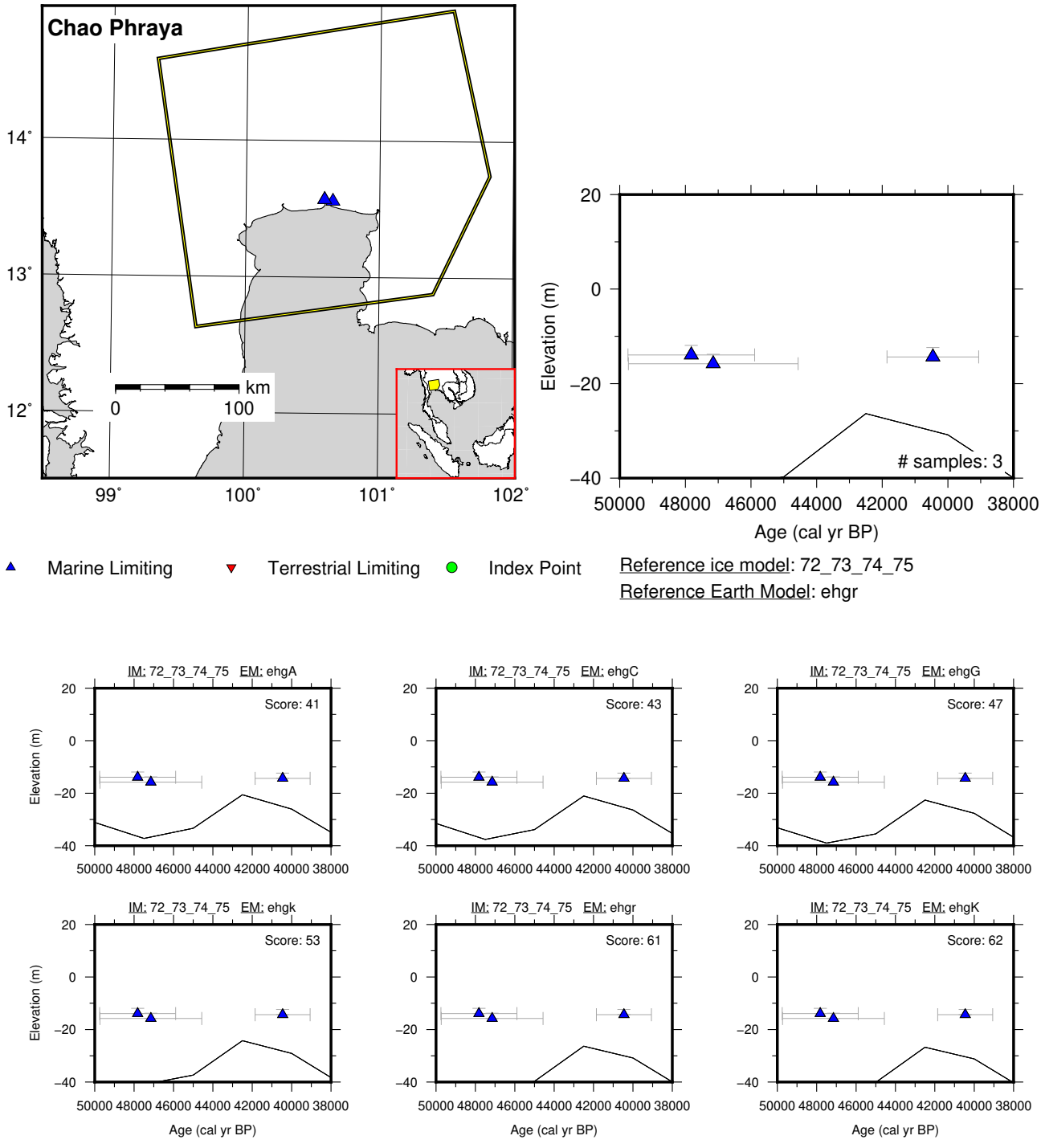


Figure 93: Paleo-sea level and comparison of six models for subregion Sundaland (MIS3 - MIS4), location Chao Phraya.

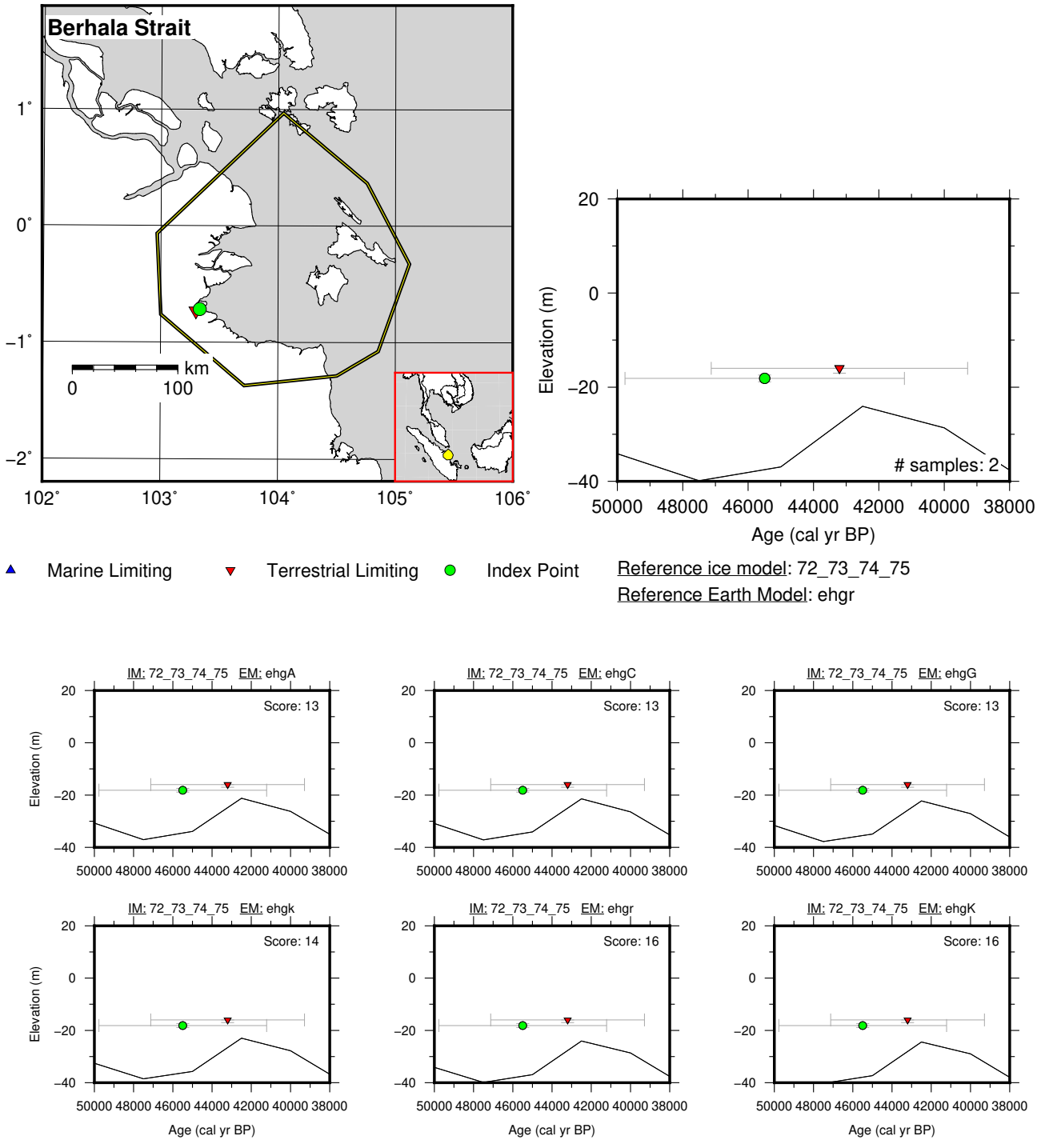


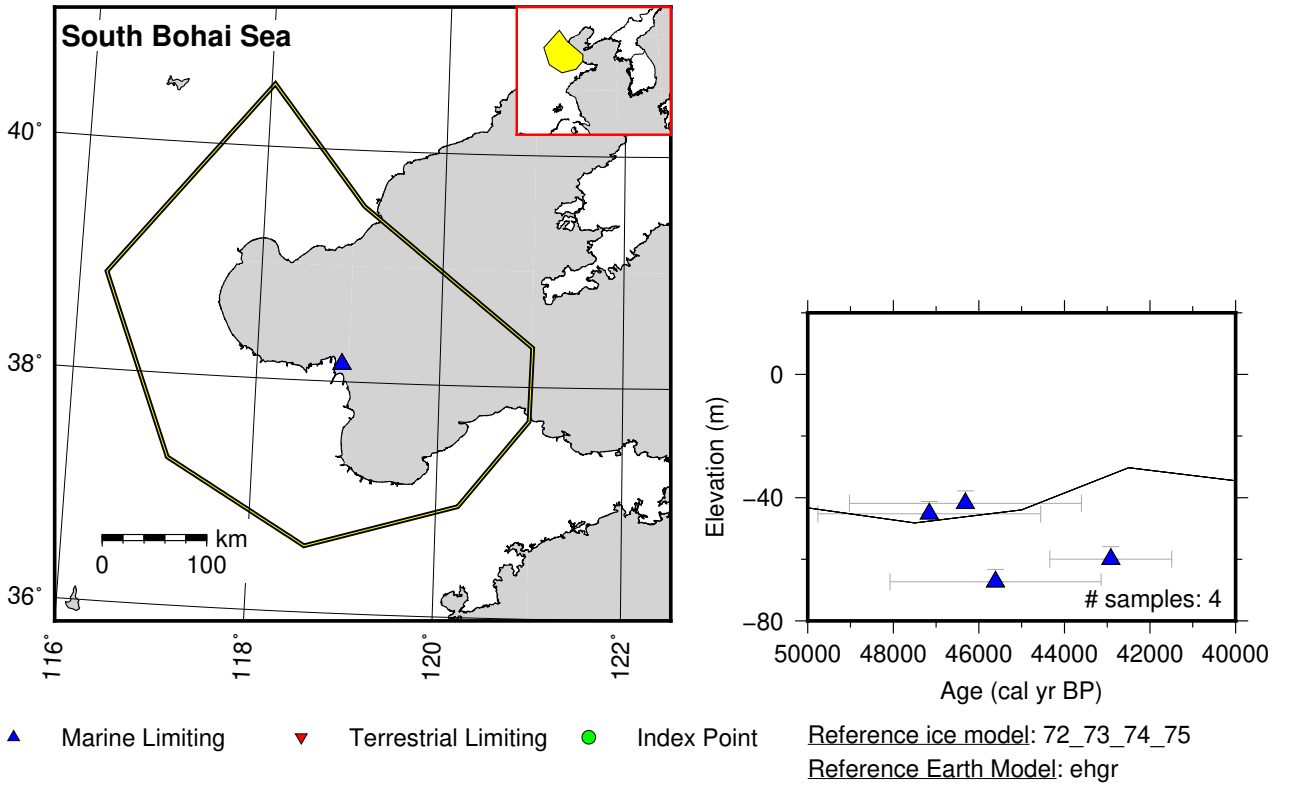
Figure 94: Paleo-sea level and comparison of six models for subregion Sundaland (MIS3 - MIS4), location Berhala Strait.

10.6 Yellow Sea (MIS3 - MIS4)

References for the data used in each location.

South Bohai Sea: Liu et al. (2009); Pico et al. (2016)

Yellow Sea: Liu et al. (2010); Pico et al. (2016); Wang et al. (2014)



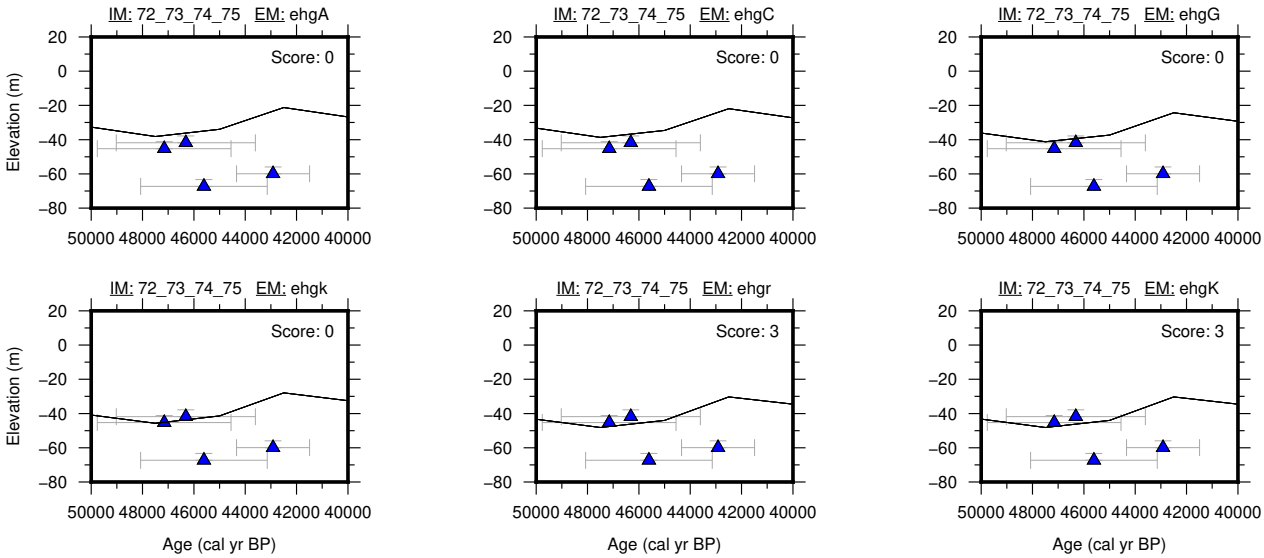


Figure 95: Paleo-sea level and comparison of six models for subregion Yellow Sea (MIS3 - MIS4), location South Bohai Sea.

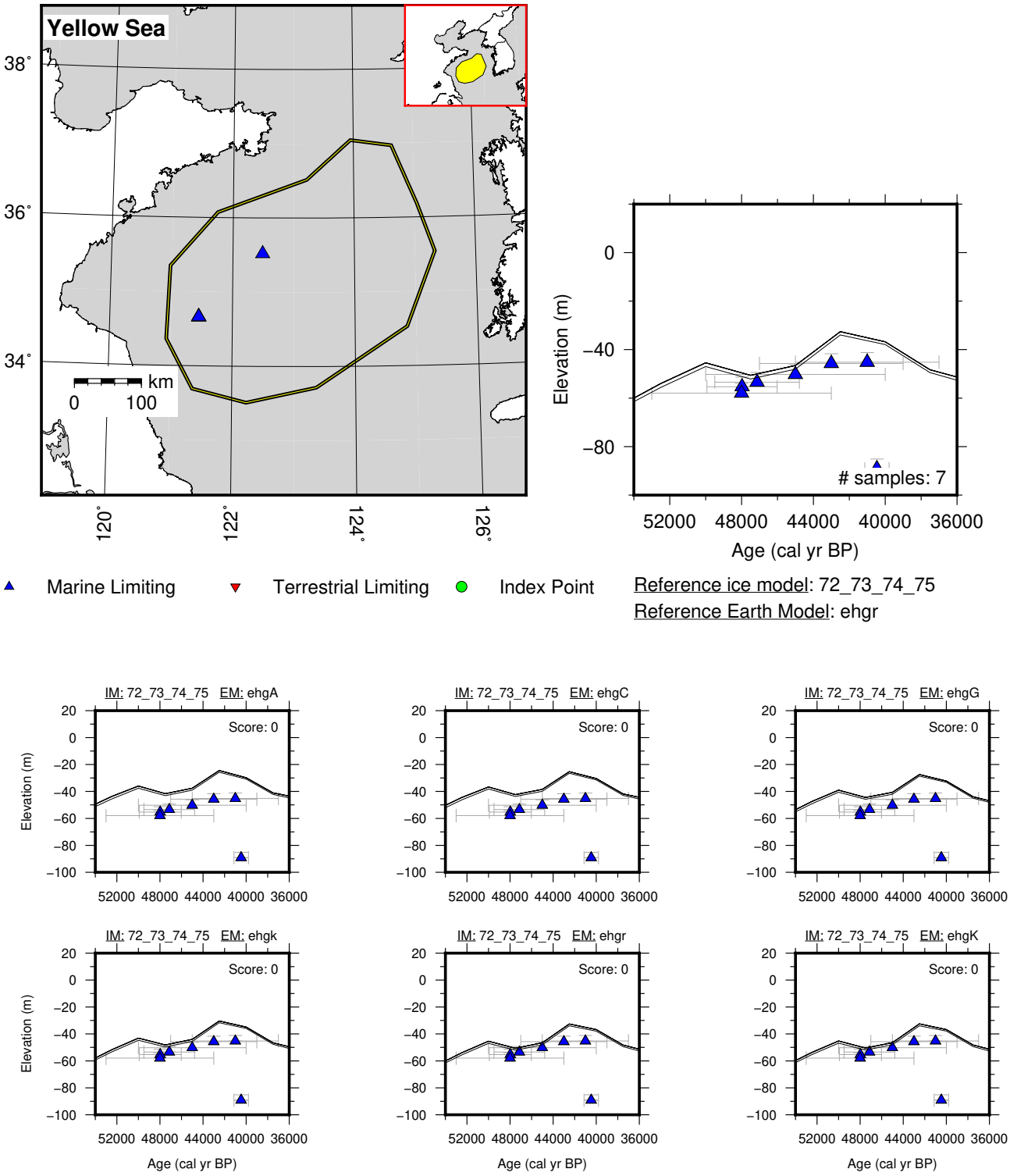


Figure 96: Paleo-sea level and comparison of six models for subregion Yellow Sea (MIS3 - MIS4), location Yellow Sea.

11 North America

11.1 Eastern United States

References for the data used in each location.

Outer Delaware: Belknap (1975); Fletcher et al. (1993); Nikitina et al. (2000); Ramsey and Baxter (1996)

Inner Delaware: Belknap (1975); Kraft (1976); Leorri et al. (2006); Marx (1981); Nikitina et al. (2000); Ramsey and Baxter (1996); Rogers and Pizzuto (1994)

Inner Chesapeake: Cinquemani et al. (1982); Colman et al. (2002)

Eastern Shore: Engelhart et al. (2009); Finkelstein and Ferland (1987); Newman and Rusnak (1965); van de Plassche (1990)

Northern North Carolina: Emery et al. (1967); Horton et al. (2009); Kemp (2009); Mallinson et al. (2005); Sears (1973); Stanton (2008)

Southern North Carolina: Cinquemani et al. (1982); Culver et al. (2007); Field et al. (1979); Horton et al. (2009); Kemp (2009); Spaur and Snyder (1999)

Northern South Carolina: Cinquemani et al. (1982); Gayes et al. (1992)

Southern South Carolina: Cinquemani et al. (1982)

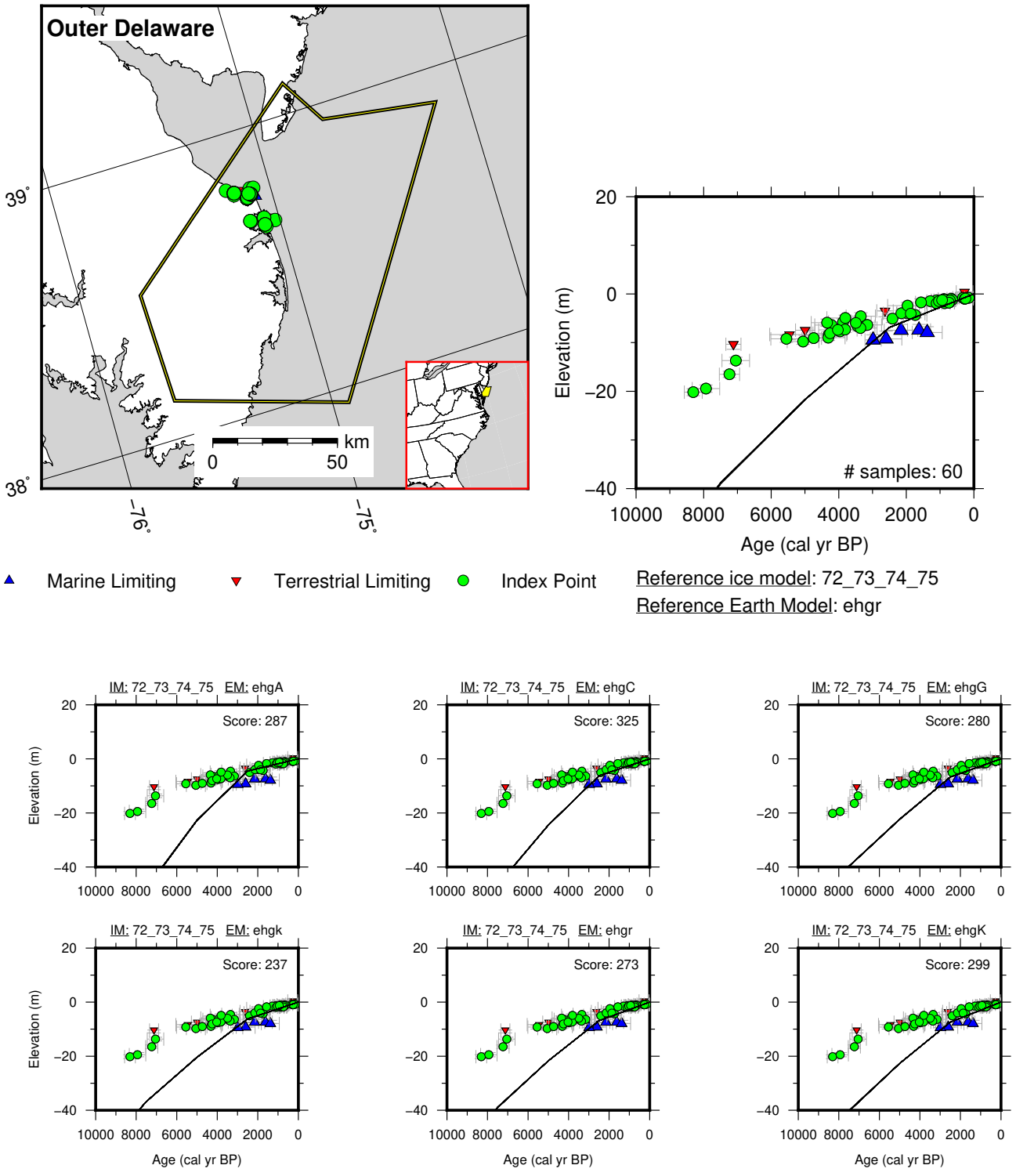


Figure 97: Paleo-sea level and comparison of six models for subregion Eastern United States, location Outer Delaware.

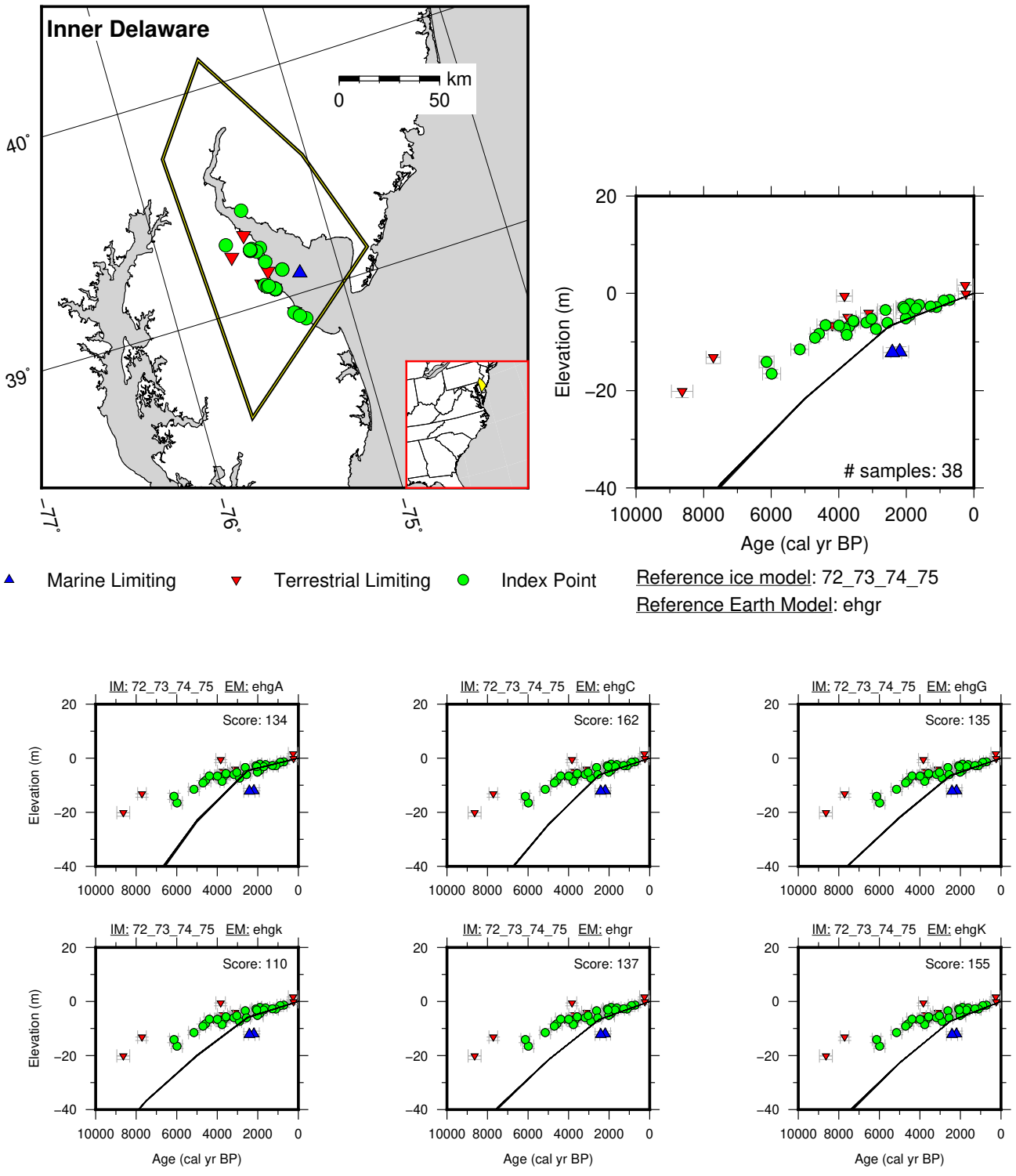


Figure 98: Paleo-sea level and comparison of six models for subregion Eastern United States, location Inner Delaware.

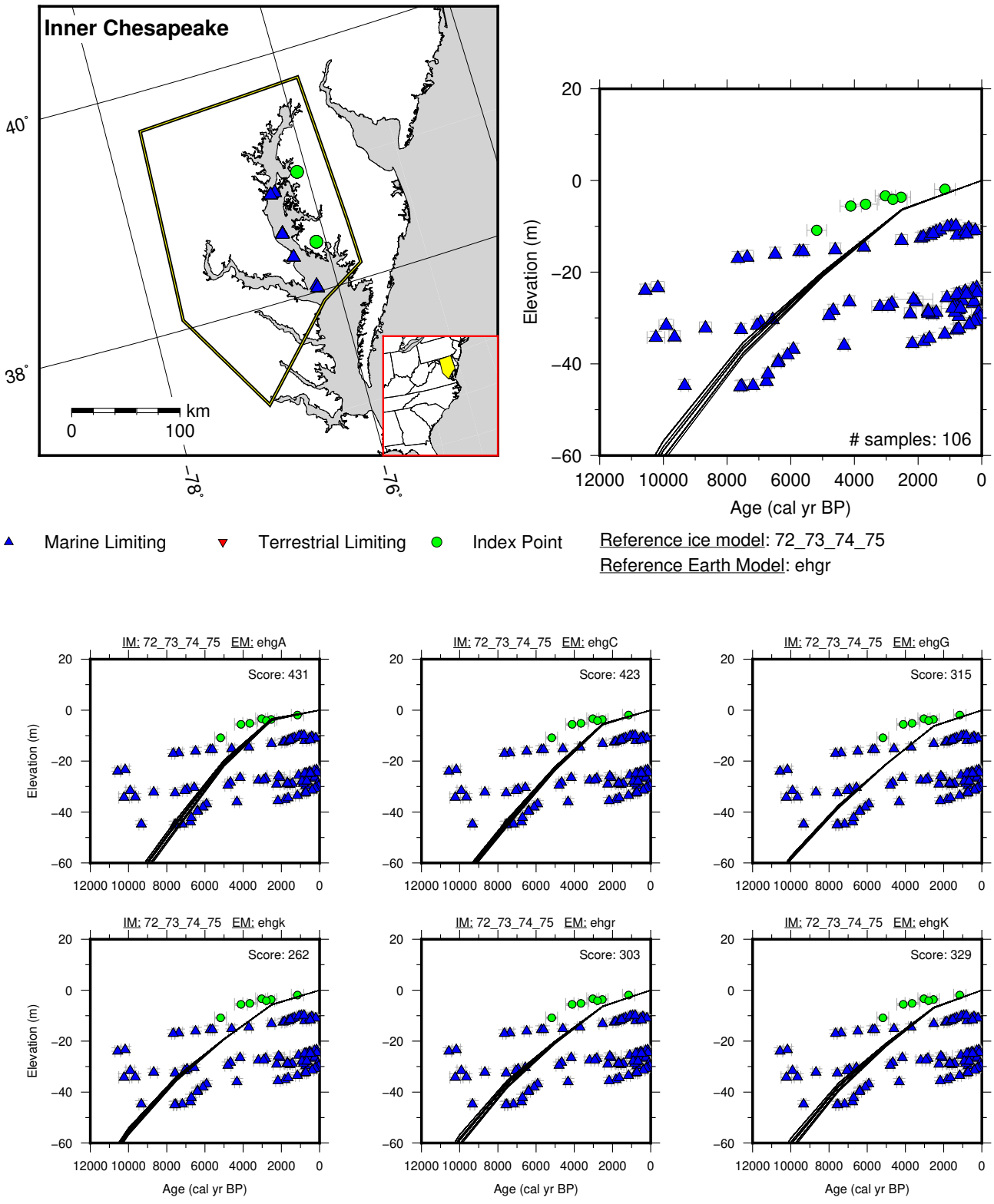
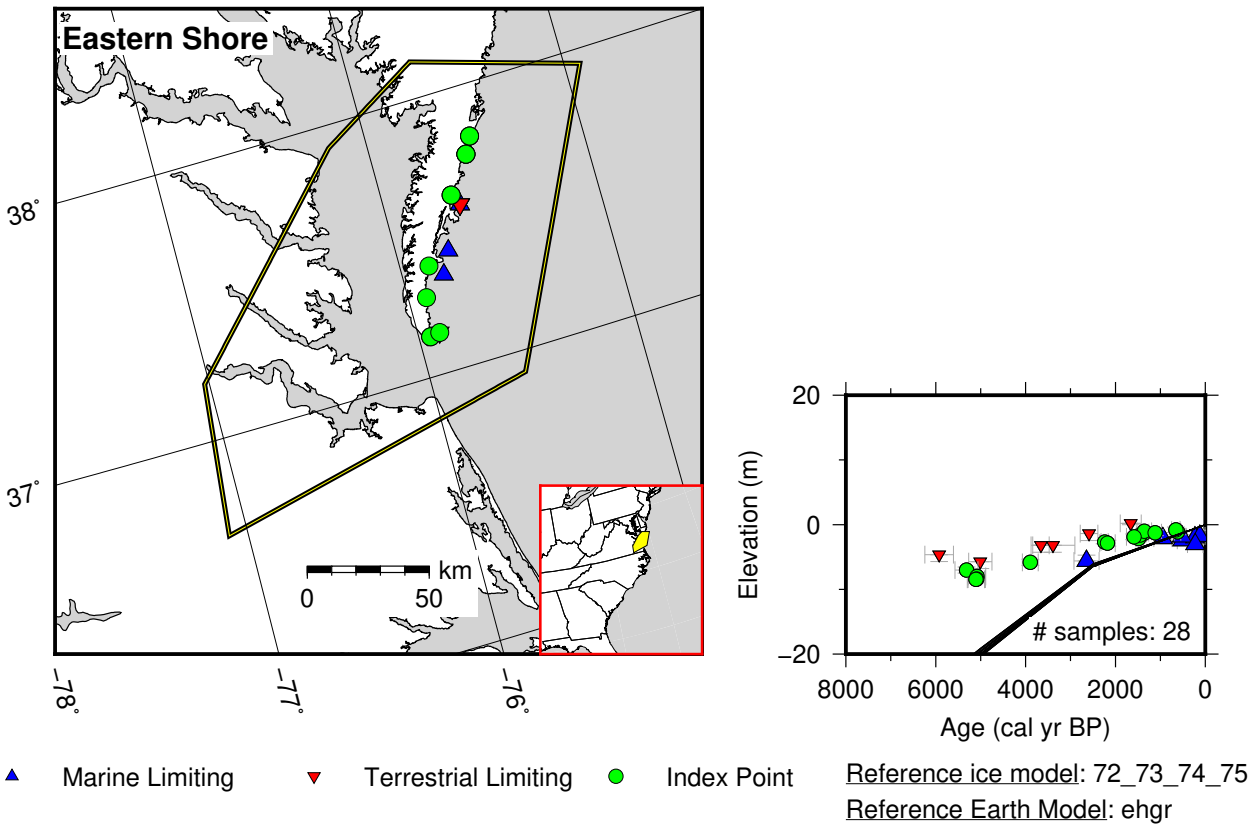


Figure 99: Paleo-sea level and comparison of six models for subregion Eastern United States, location Inner Chesapeake.



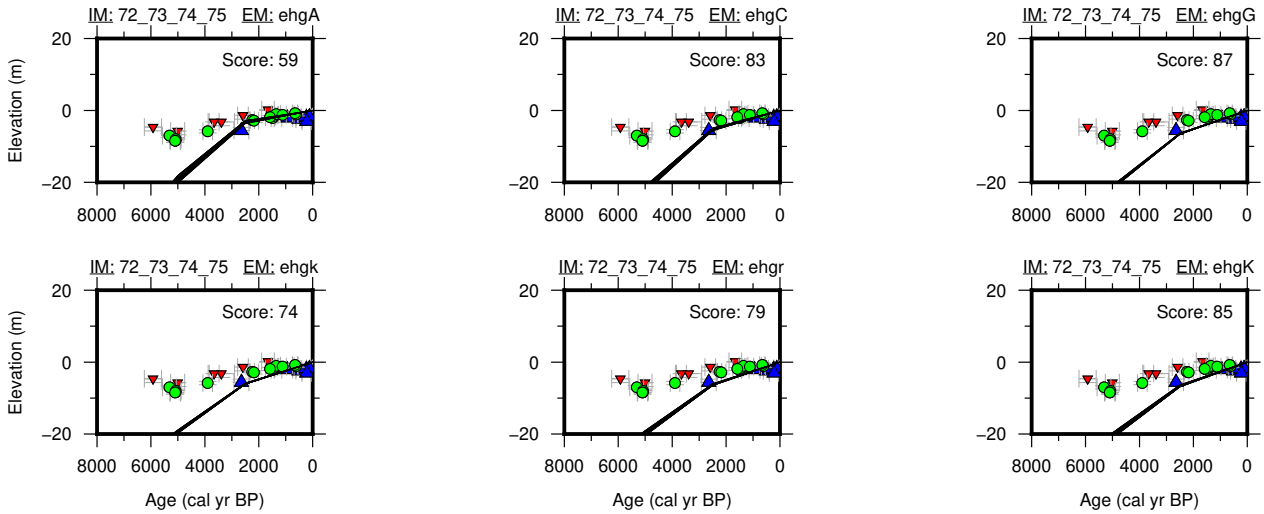


Figure 100: Paleo-sea level and comparison of six models for subregion Eastern United States, location Eastern Shore.

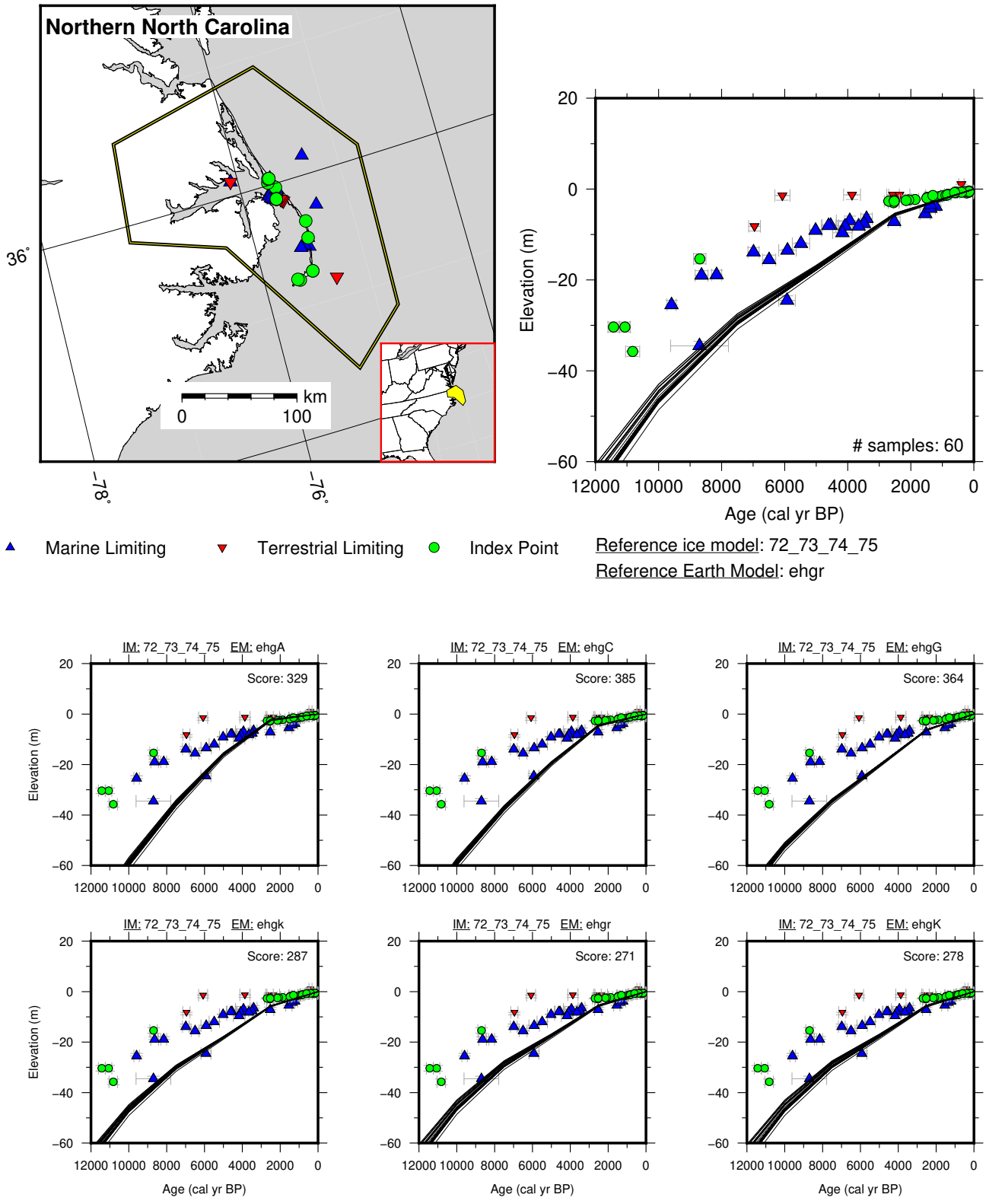


Figure 101: Paleo-sea level and comparison of six models for subregion Eastern United States, location Northern North Carolina.

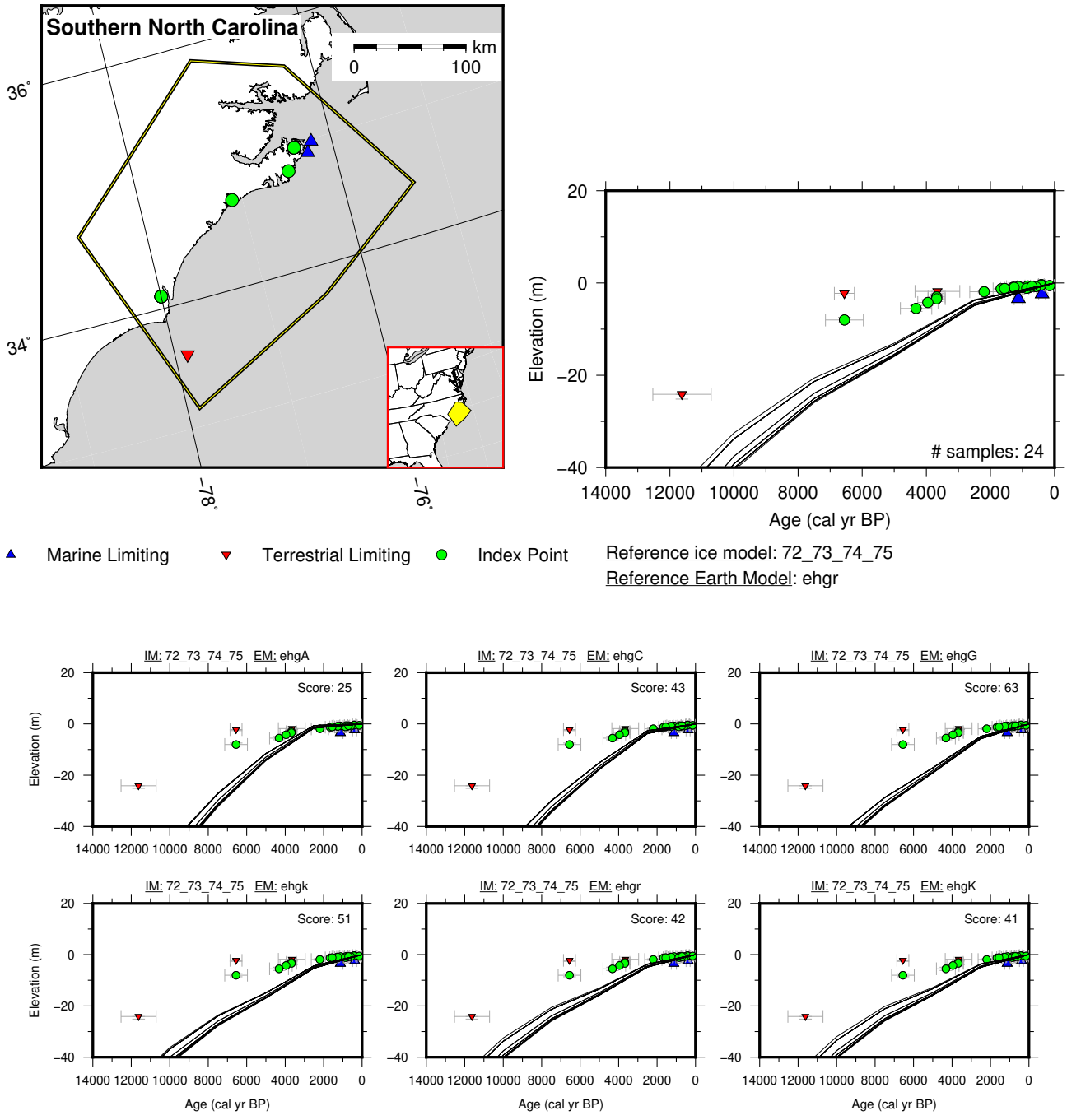


Figure 102: Paleo-sea level and comparison of six models for subregion Eastern United States, location Southern North Carolina.

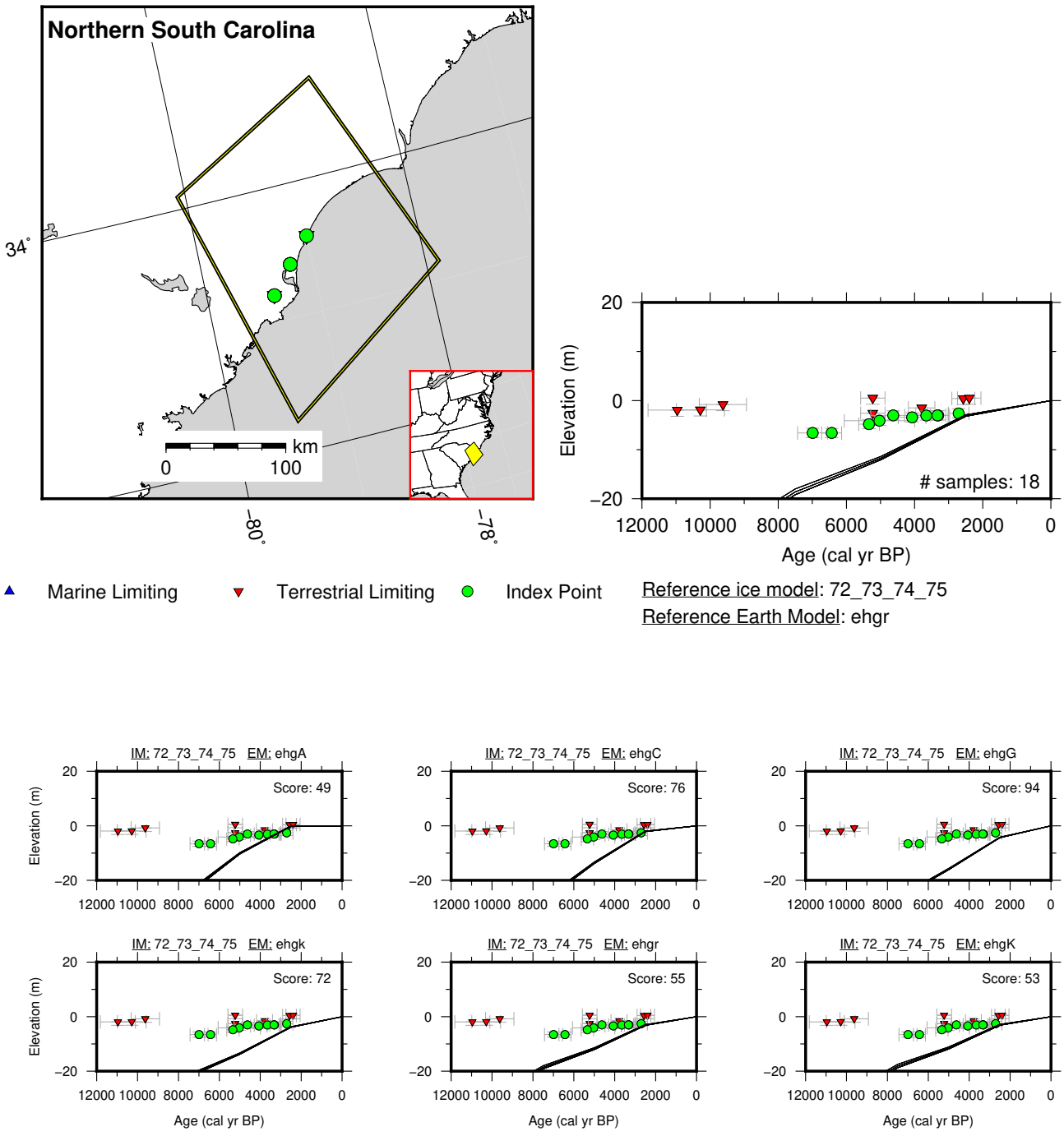
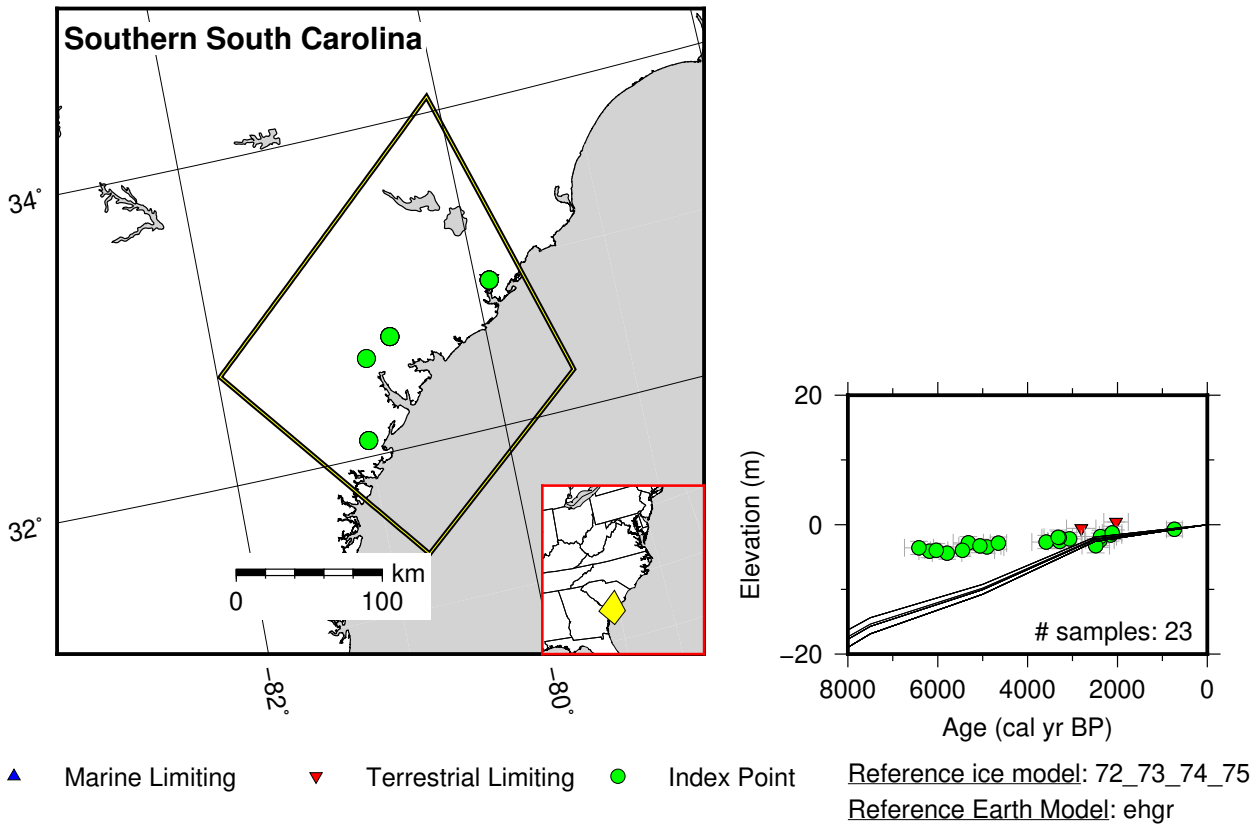


Figure 103: Paleo-sea level and comparison of six models for subregion Eastern United States, location Northern South Carolina.



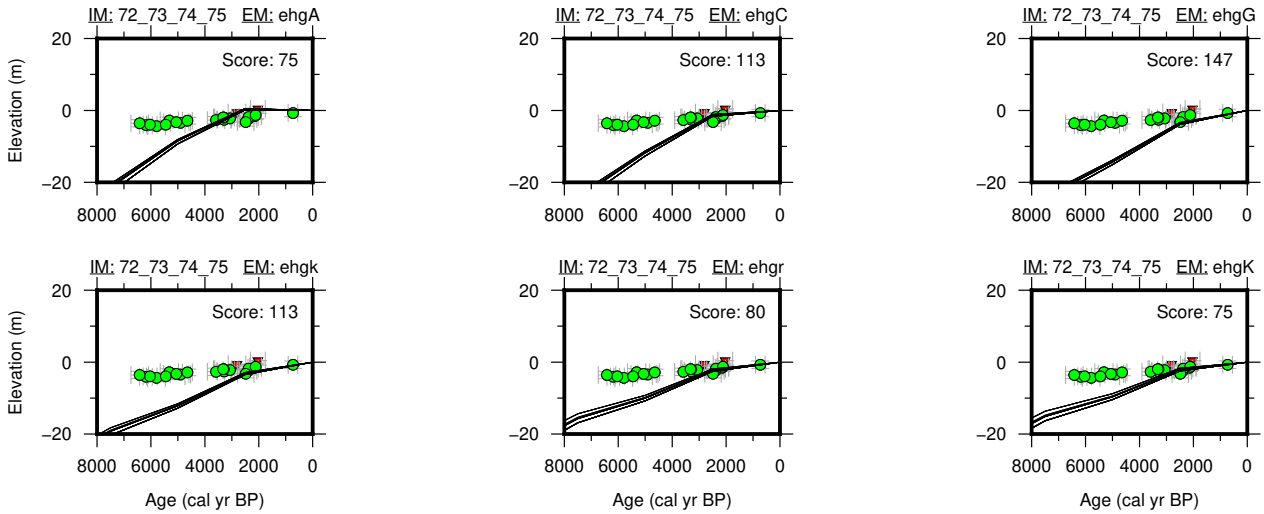


Figure 104: Paleo-sea level and comparison of six models for subregion Eastern United States, location Southern South Carolina.

11.2 Gulf of St Lawrence

References for the data used in each location.

Cape Breton: Blake and Lowdon (1976); Miller and Livingstone (1993); Shaw et al. (2009)

Magdalen Islands: Barnett et al. (2017); Dredge et al. (1992); Rémillard et al. (2016, 2017)

Prince Edward Island: Kranck (1972); McCallum and Wittenberg (1965); McNeely and Brennan (2005); Ogden and Hart (1976); Scott et al. (1981, 1987); Stea and Mott (1989); Walton et al. (1961)

Chaleur Bay: McNeely and Brennan (2005); Rampton et al. (1984)

Anticosti Island: Dubois et al. (1988); Lavoie and Filion (2001); Painchaud et al. (1984)

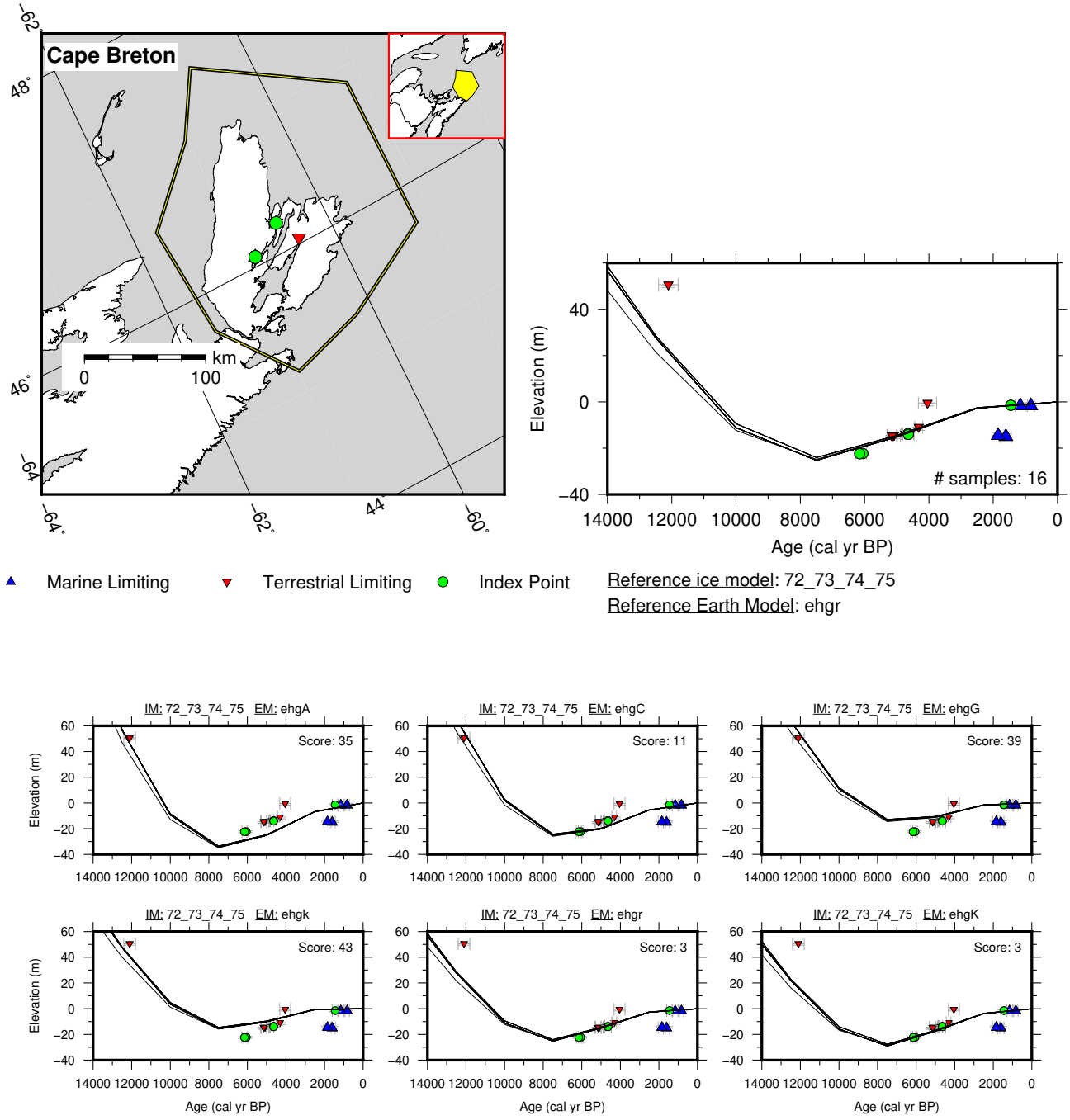


Figure 105: Paleo-sea level and comparison of six models for subregion Gulf of St Lawrence, location Cape Breton.

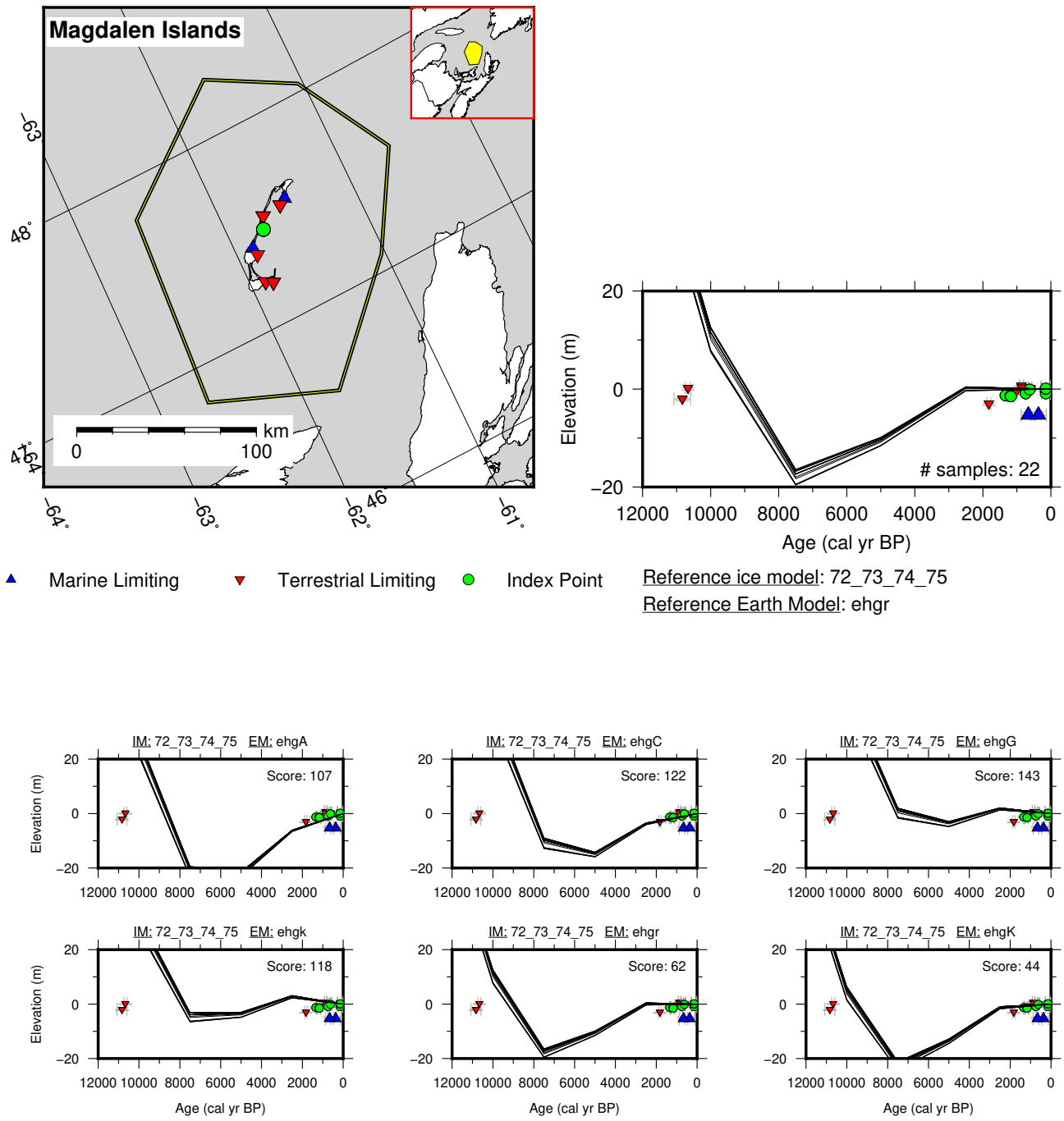
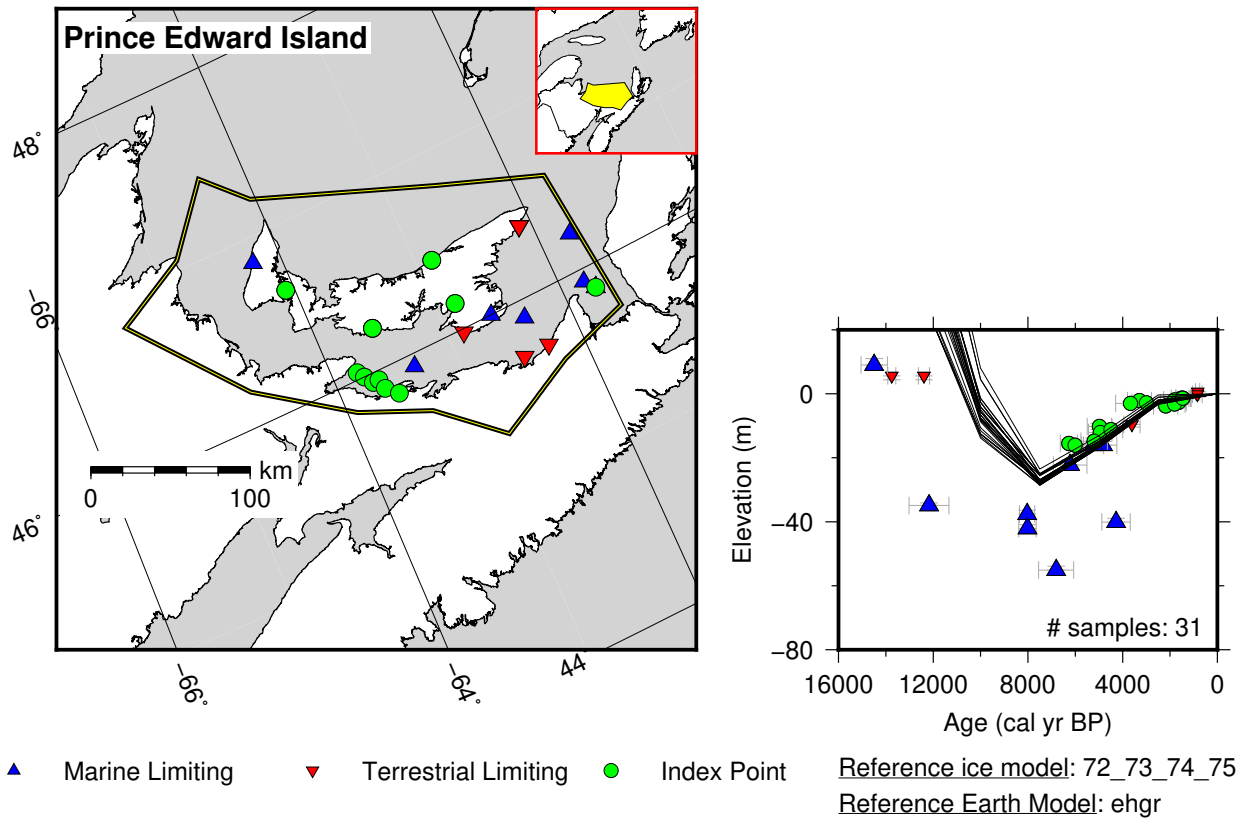


Figure 106: Paleo-sea level and comparison of six models for subregion Gulf of St Lawrence, location Magdalen Islands.



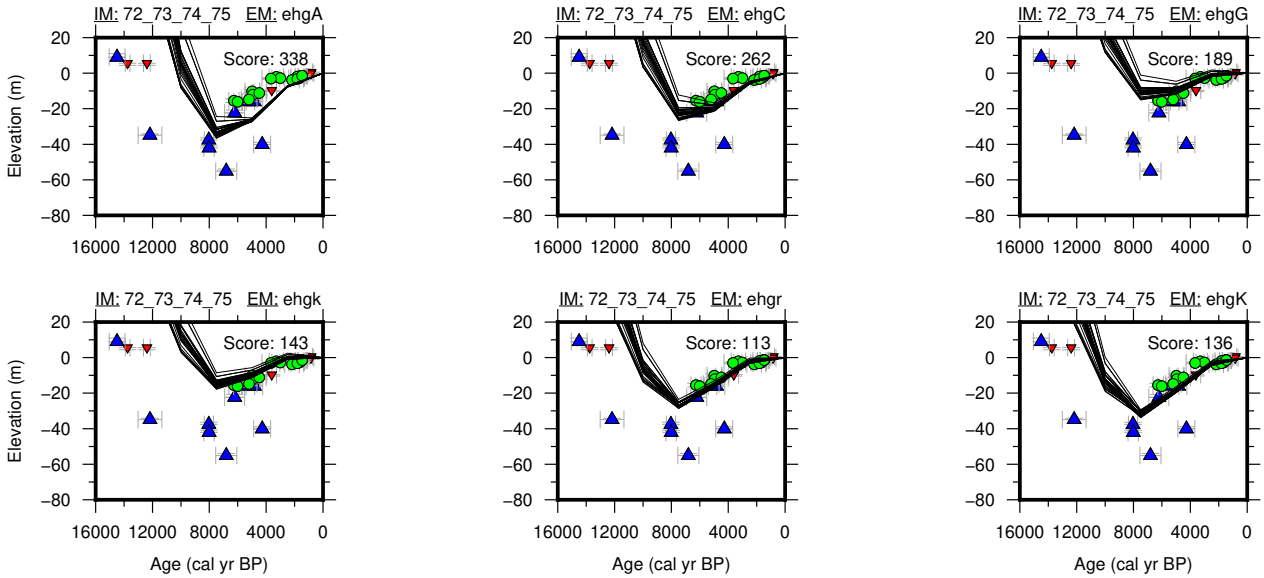


Figure 107: Paleo-sea level and comparison of six models for subregion Gulf of St Lawrence, location Prince Edward Island.

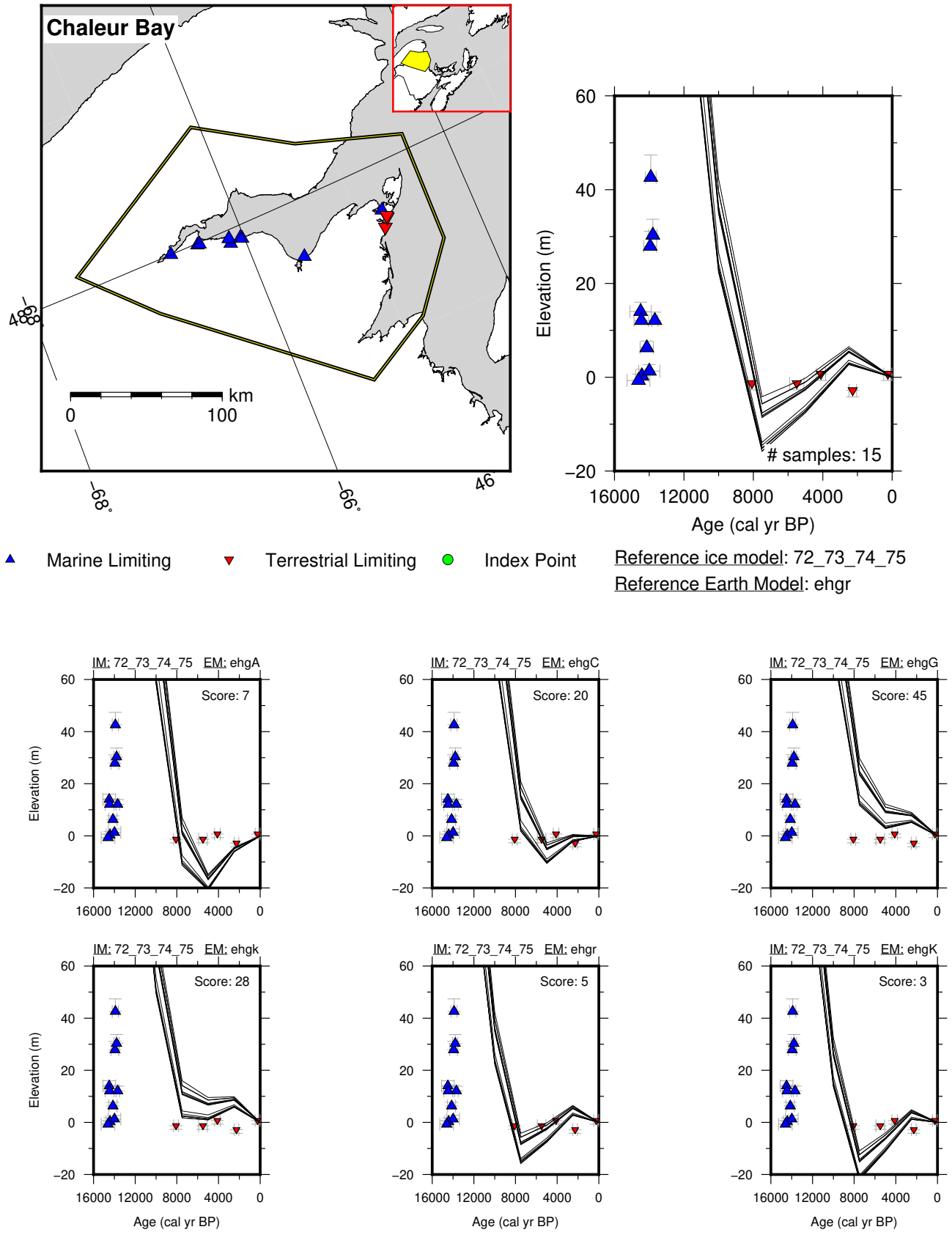


Figure 108: Paleo-sea level and comparison of six models for subregion Gulf of St Lawrence, location Chaleur Bay.

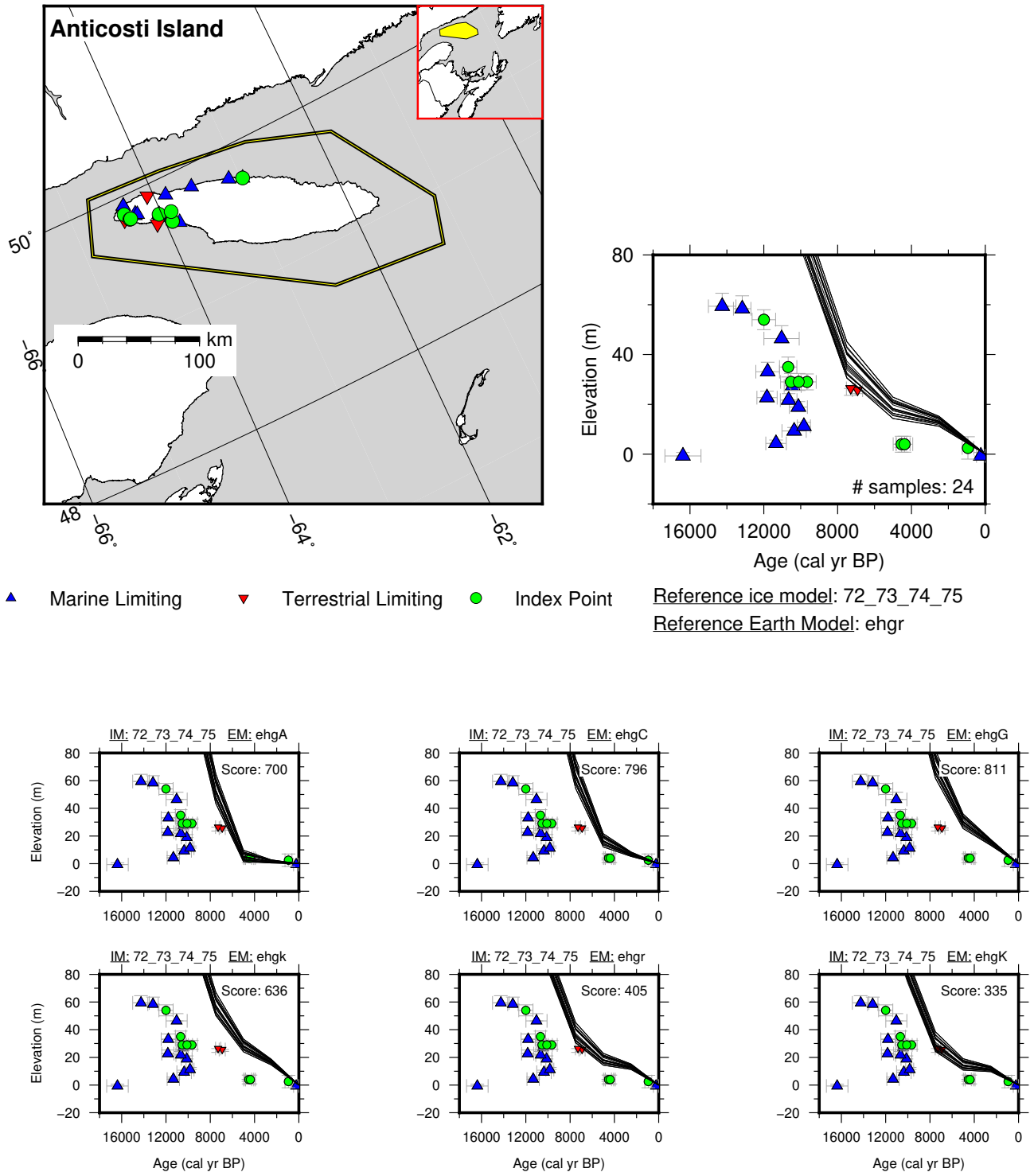


Figure 109: Paleo-sea level and comparison of six models for subregion Gulf of St Lawrence, location Anticosti Island.

11.3 Hudson Bay

References for the data used in each location.

Kivalliq: Aylsworth et al. (1981); Blake (1983, 1986, 1988); Dyck and Fyles (1962); Dyck et al. (1966); Lowdon and Blake (1970); Lowdon and Blake (1979); McNeely and Atkinson (1995); Morrison (1989); Ridler (1974); Rutherford et al. (1973, 1979); Simon et al. (2014); Walton et al. (1961)

Churchill: Anderson and Hodgetts (2007); Andrews and Falconer (1969); Blake (1982, 1988); Dyck and Fyles (1964); Hodgetts (2007); Kuhry (2008); Lowdon and Blake (1973); Lowdon et al. (1971); Meyer (1970); Morlan et al. (2000); Nash (1972); Wagner (1967)

West James Bay: Bunbury et al. (2012); Dyck et al. (1965); Dyke and Peltier (2000); Glaser et al. (2004); McAndrews et al. (1982); McNeely and Brennan (2005); Vogel and Waterbolk (1972); Webber et al. (1970)

East James Bay: Beaulieu-Audy et al. (2009); Farrand (1962); Hardy (1976); Pendea et al. (2010)

Umiujaq: Allard and Seguin (1985); Allard and Tremblay (1983a,b); Cayer (2003); Filion et al. (1991); Gajewski and Garralla (1992); Hillaire-Marcel (1976); Lajeunesse and Allard (2003); Lamarre et al. (2012); Lavoie et al. (2012); Lowdon and Blake (1980); Lowdon et al. (1967); McNeely (2006); Plumet (1974); Saulnier-Talbot and Pienitz (2001); Walcott and Craig (1975)

Inukjuak: Andrews and Falconer (1969); Andrews and Short (1983); Buckley and Willis (1970); Harington (2003); Lauriol and Gray (1997); Lemieux et al. (2011); Lowdon and Blake (1968); Saint-Laurent and Filion (1992); Wagner (1967)

Ivujivik: Daigneault (2008); Harington (2003); Martindale et al. (2020); Matthews (1966, 1967); McNeely and Brennan (2005); Wagner (1967)

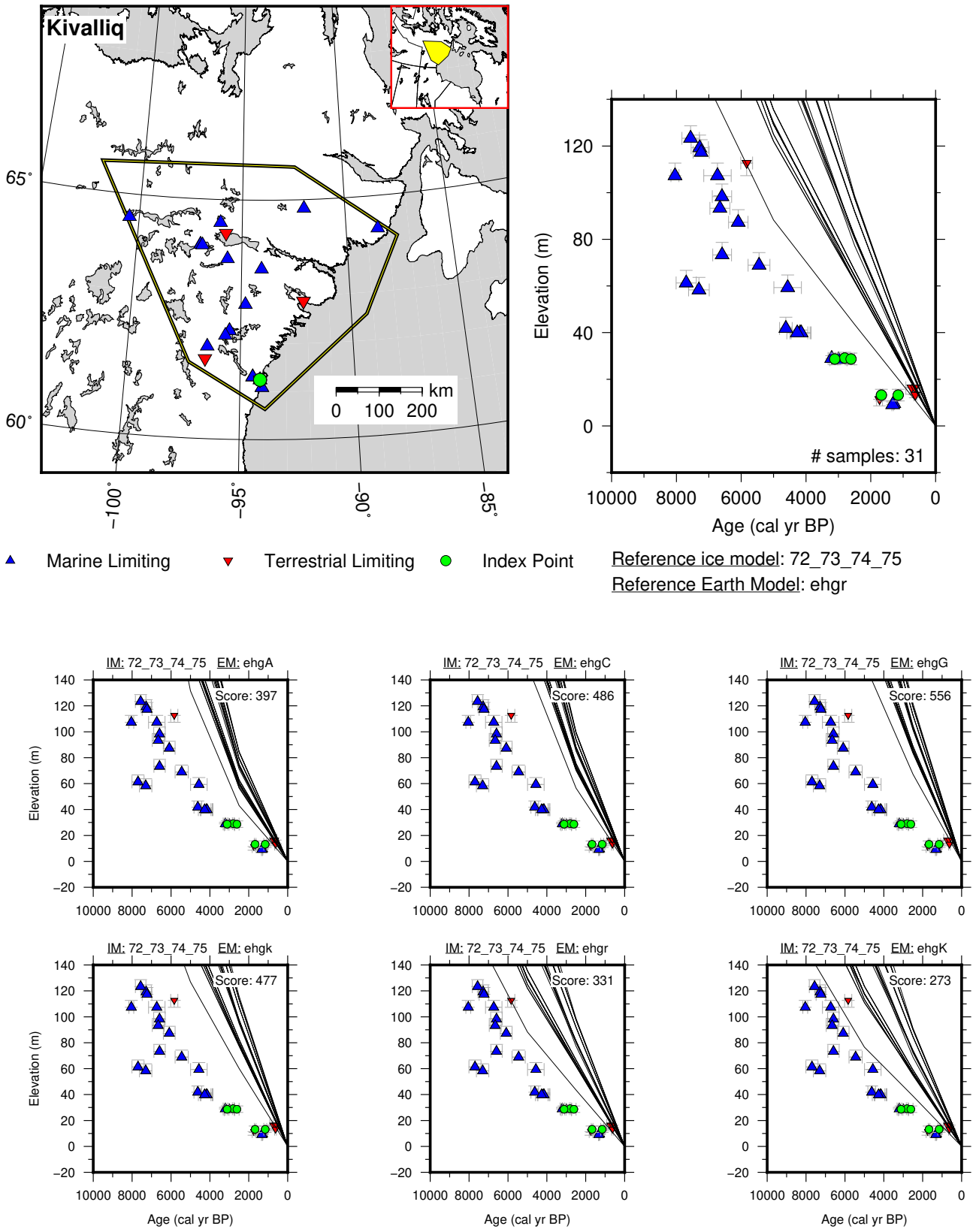


Figure 110: Paleo-sea level and comparison of six models for subregion Hudson Bay, location Kivalliq.

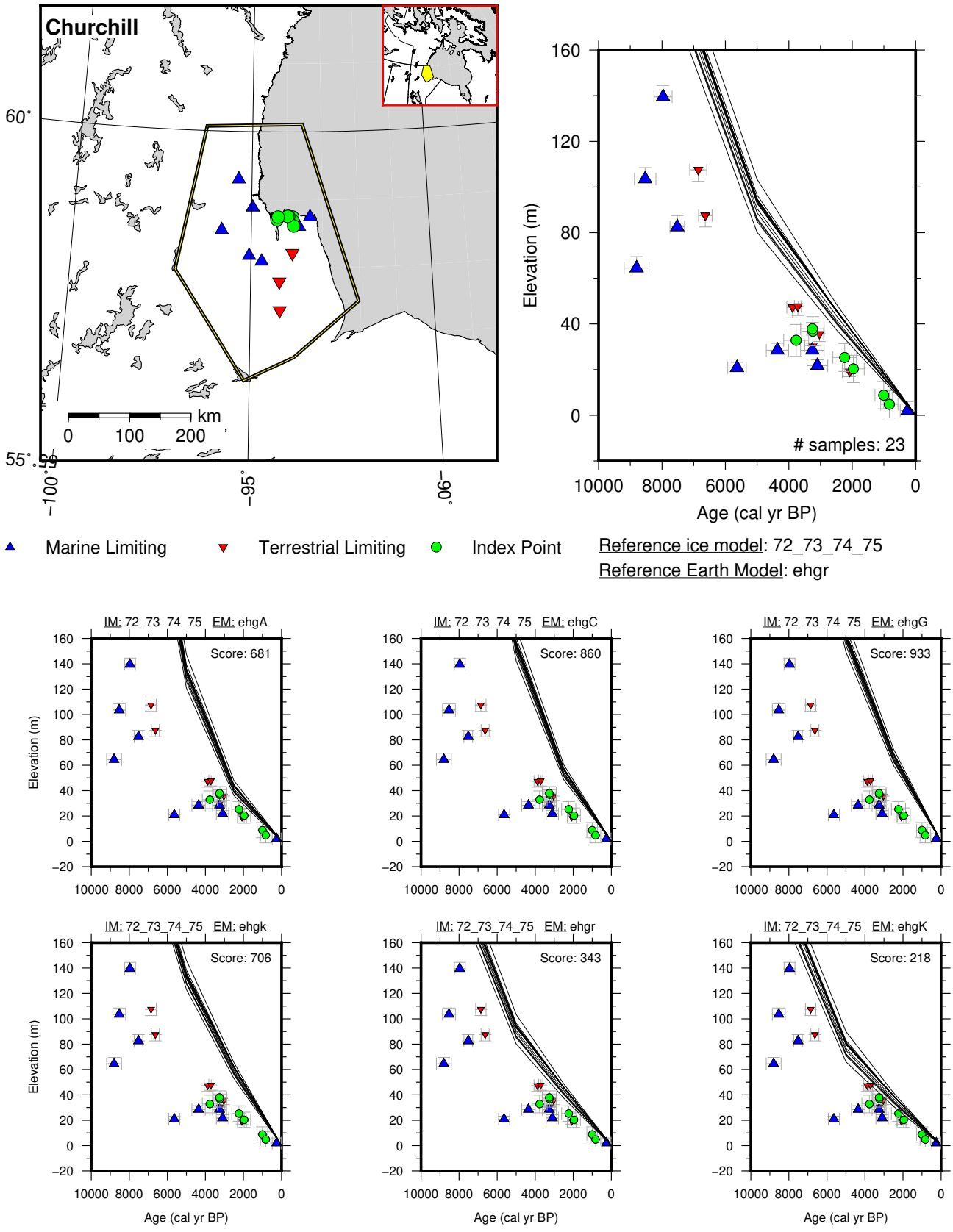


Figure 111: Paleo-sea level and comparison of six models for subregion Hudson Bay, location Churchill.

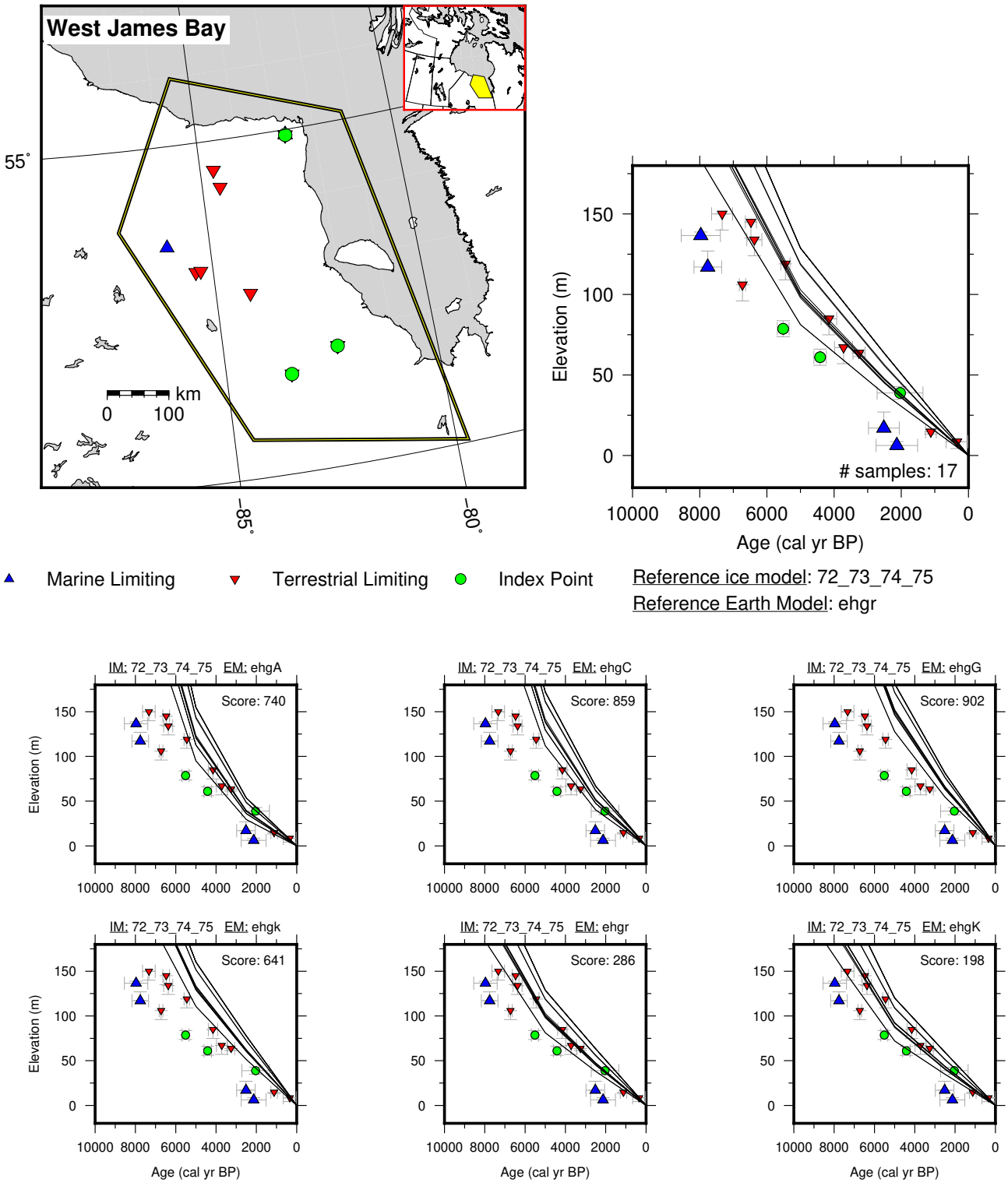


Figure 112: Paleo-sea level and comparison of six models for subregion Hudson Bay, location West James Bay.

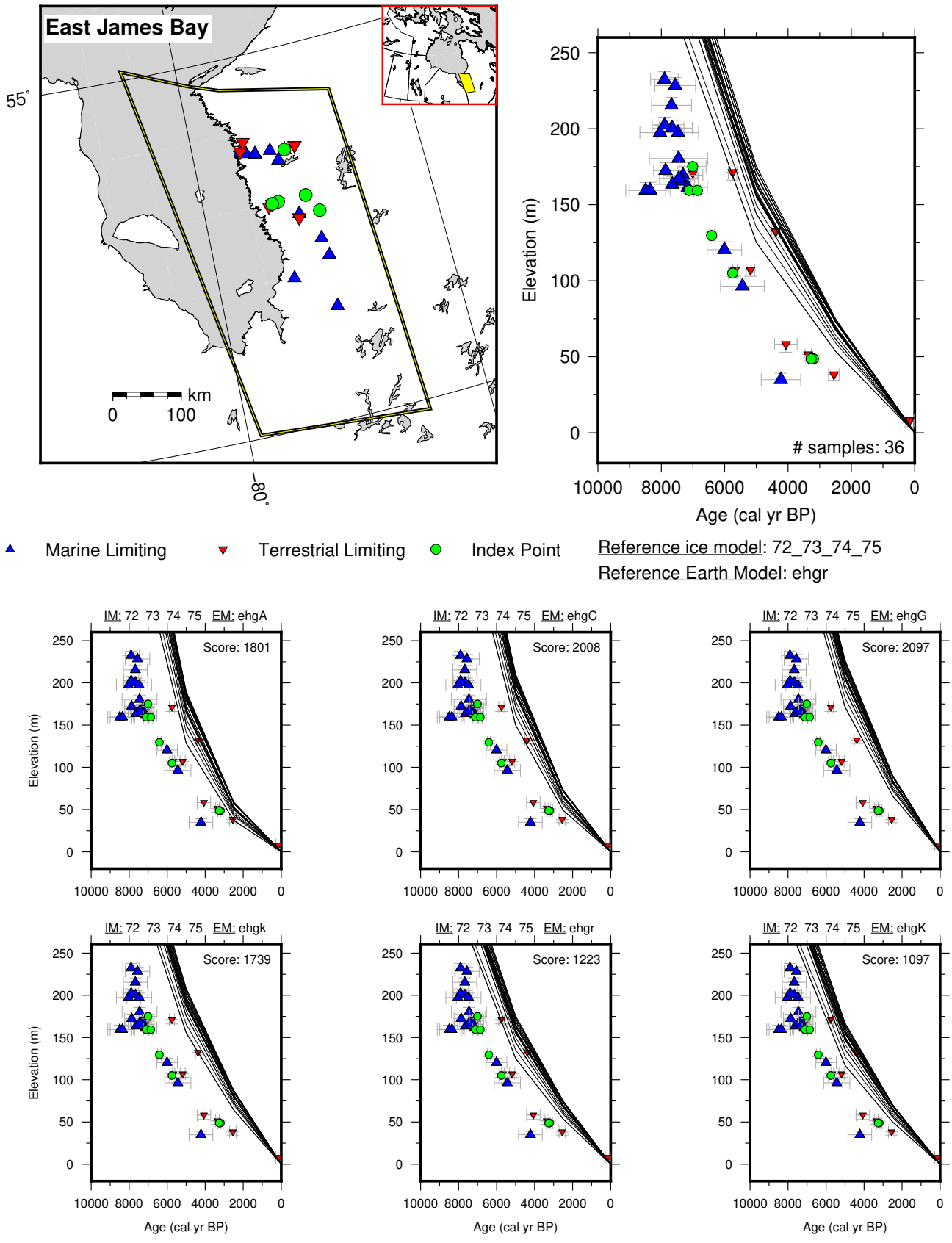


Figure 113: Paleo-sea level and comparison of six models for subregion Hudson Bay, location East James Bay.

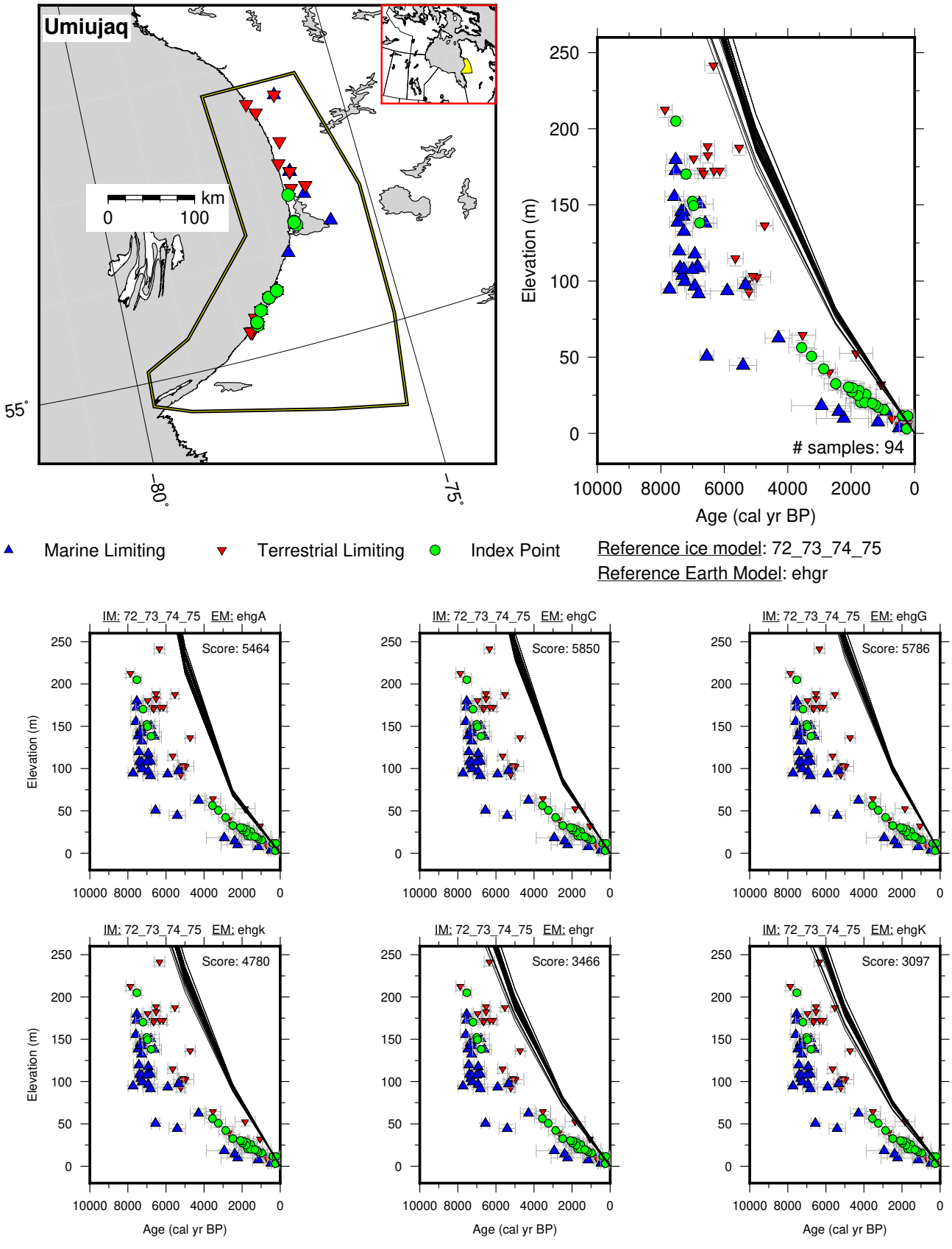


Figure 114: Paleo-sea level and comparison of six models for subregion Hudson Bay, location Umiujaq.

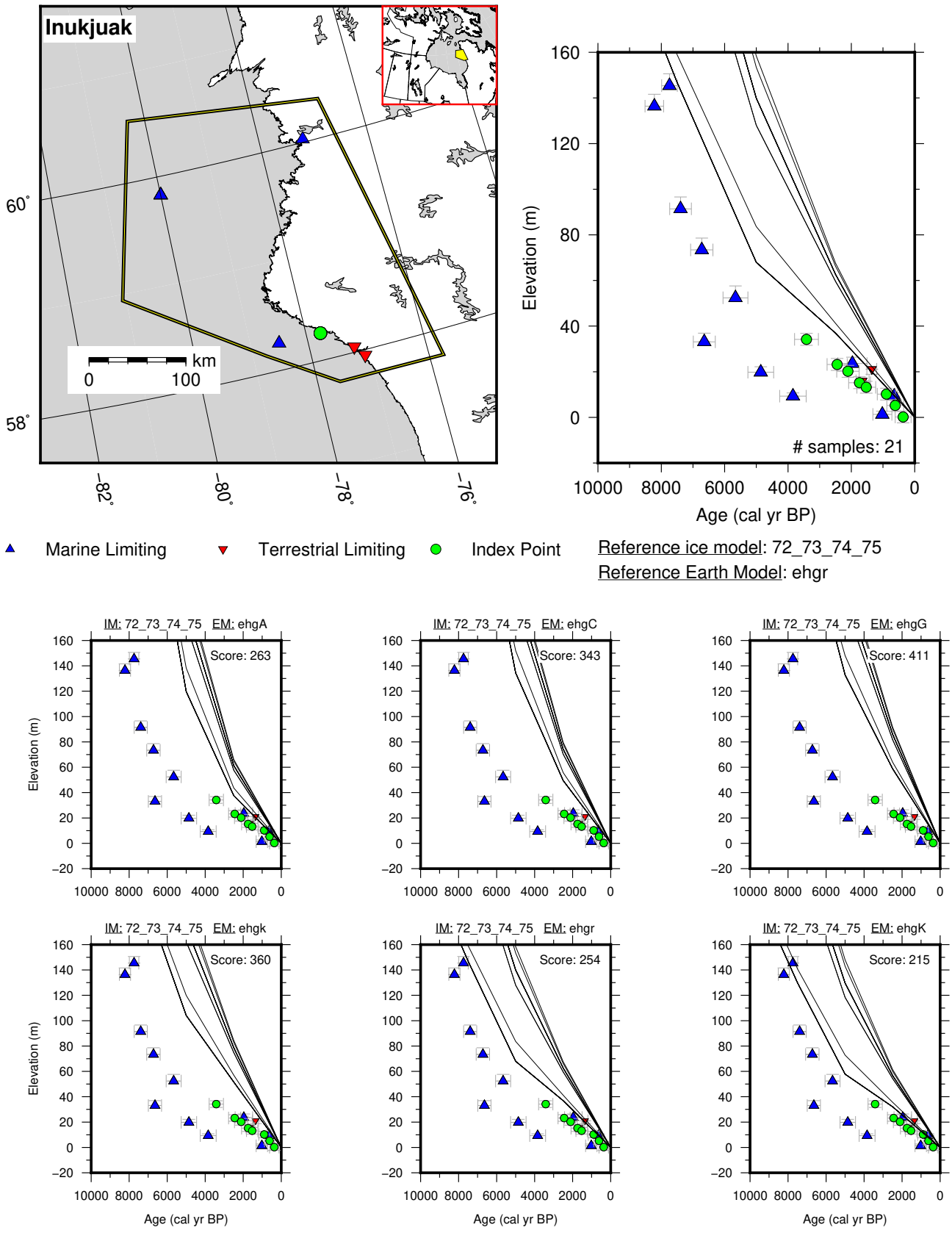


Figure 115: Paleo-sea level and comparison of six models for subregion Hudson Bay, location Inukjuak.

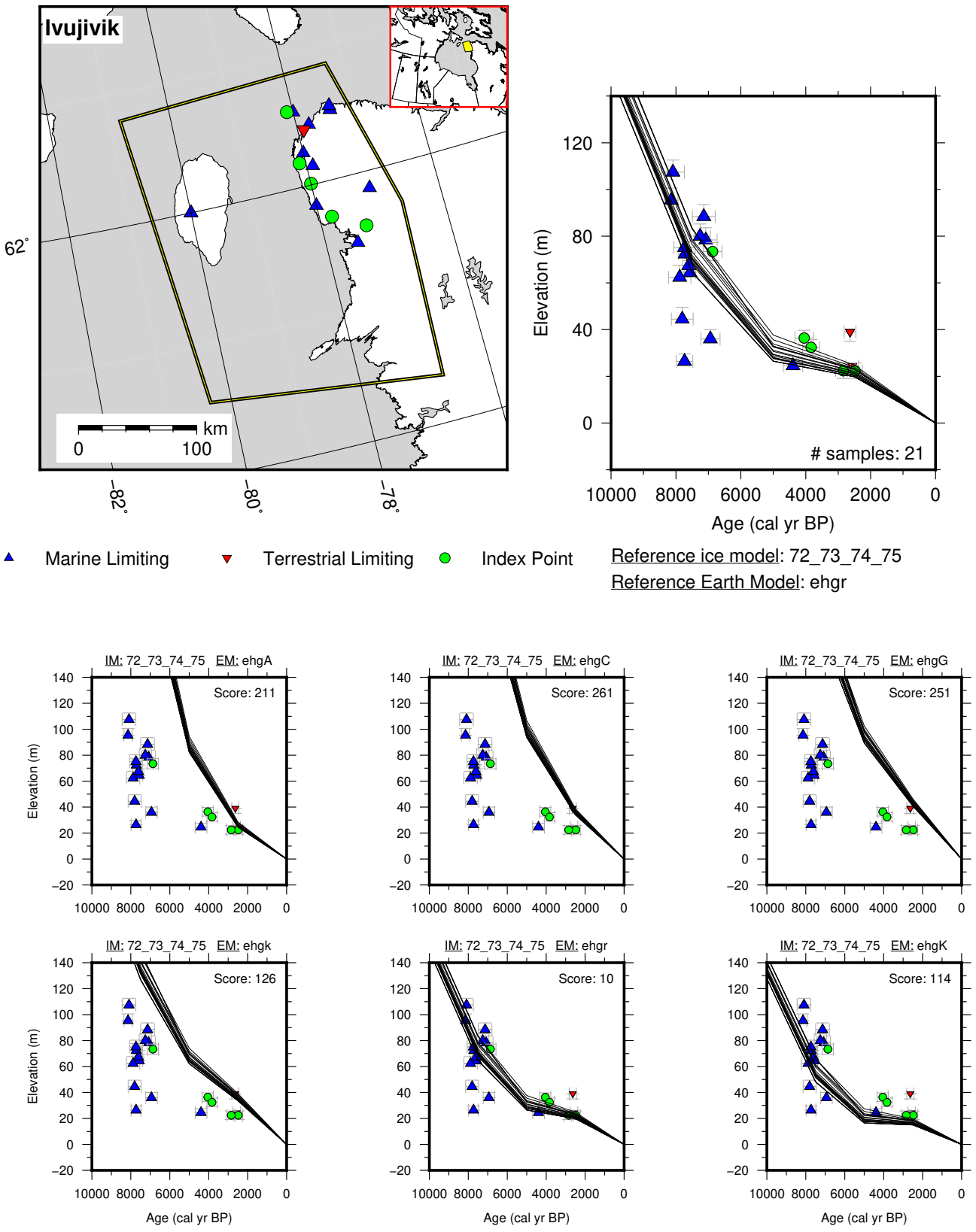


Figure 116: Paleo-sea level and comparison of six models for subregion Hudson Bay, location Ivujivik.

11.4 Hudson Strait

References for the data used in each location.

Sugluk: Bartley and Matthews (1969); Daigneault (2008); Gray et al. (1993); Gray (2001); Gray and Lauriol (1985); Kasper and Allard (2001); Lauriol and Gray (1997); Lowdon and Blake (1968); Matthews (1966); McNeely and Brennan (2005); McNeely and McCuaig (1991); Ricard (1989); Simon et al. (2016)

Kangiqsujuaq: Gray et al. (1993); Gray (2001); Lauriol and Gray (1987); McNeely (2002, 2005); McNeely and Atkinson (1995); Vacchi et al. (2018)

Western Ungava Bay: Gray et al. (1980); Lauriol and Gray (1987); Lauriol et al. (1979); Løken (1978); Simon et al. (2016)

Southern Ungava Bay: Gray et al. (1993); Gray (2001); Pienitz et al. (1991); Simon et al. (2016)

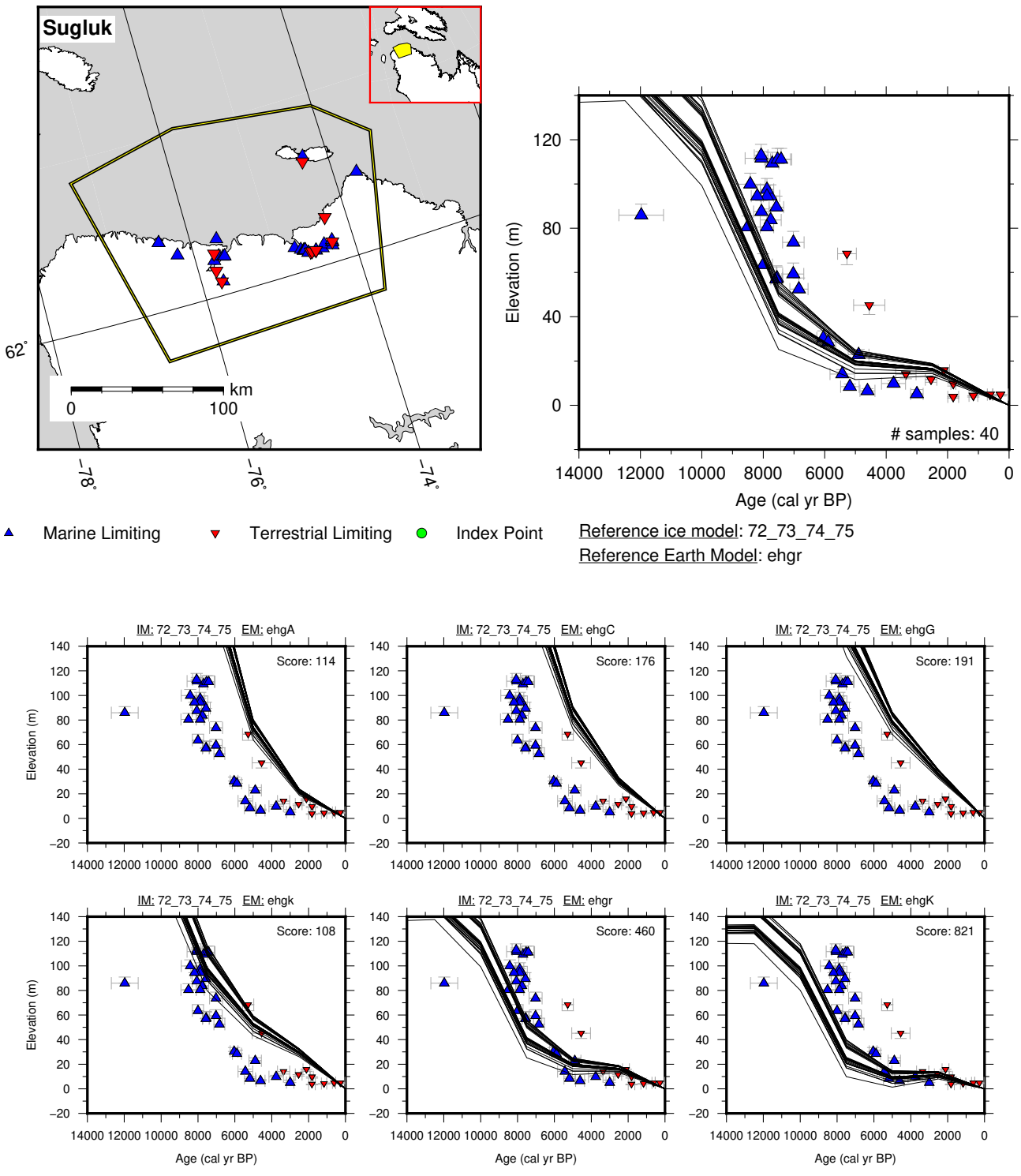


Figure 117: Paleo-sea level and comparison of six models for subregion Hudson Strait, location Sugluk.

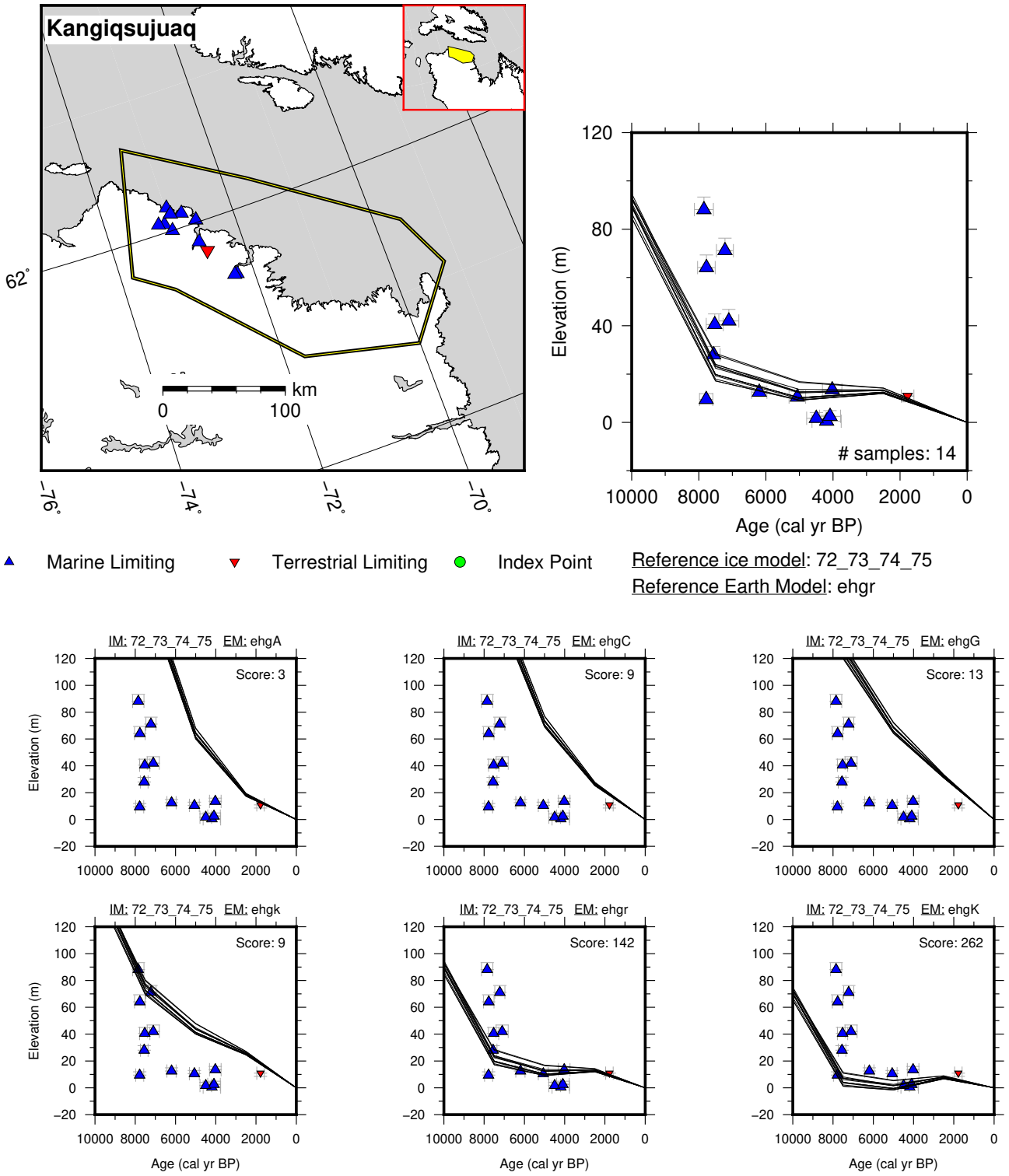


Figure 118: Paleo-sea level and comparison of six models for subregion Hudson Strait, location Kangiqsujuaq.

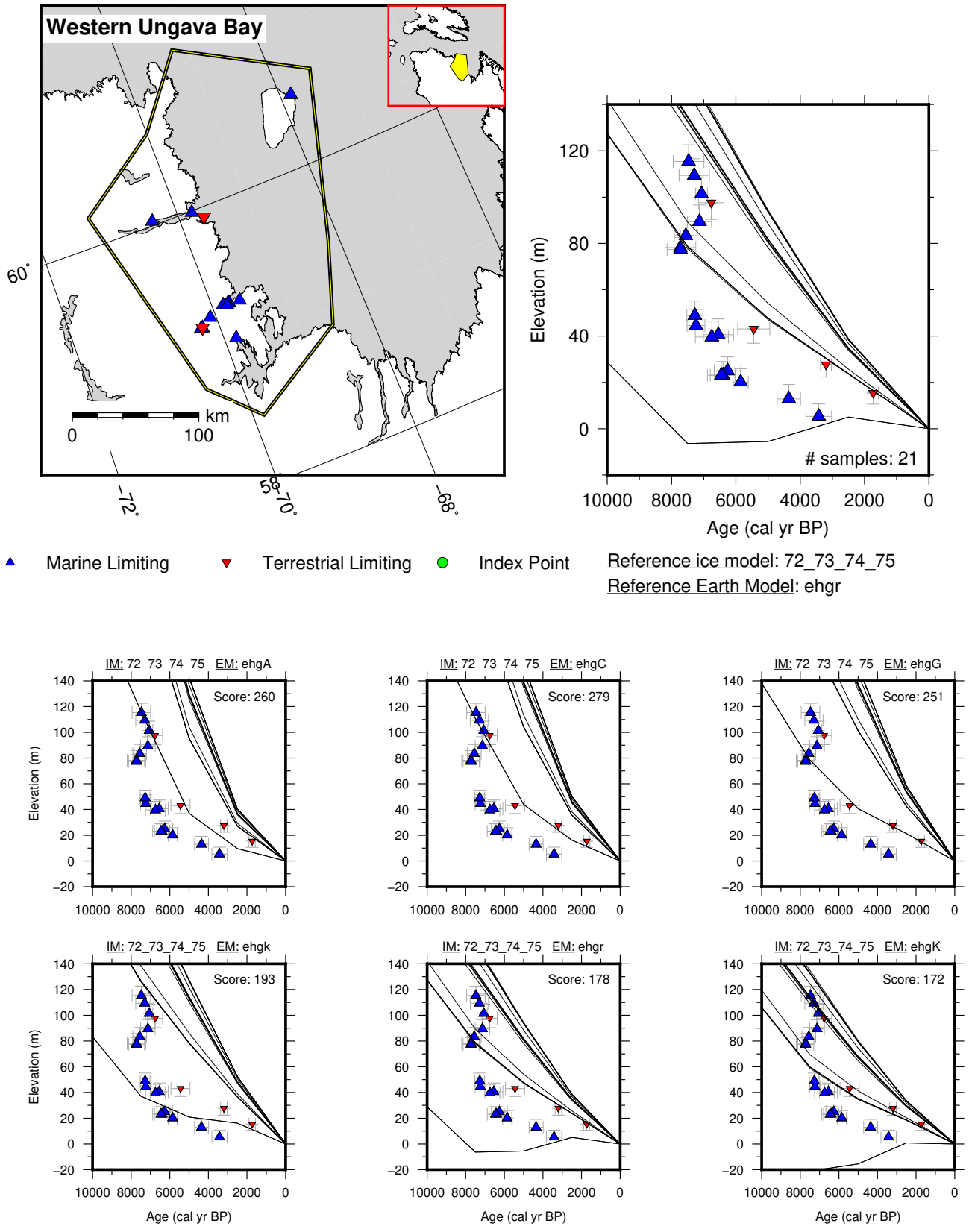


Figure 119: Paleo-sea level and comparison of six models for subregion Hudson Strait, location Western Ungava Bay.

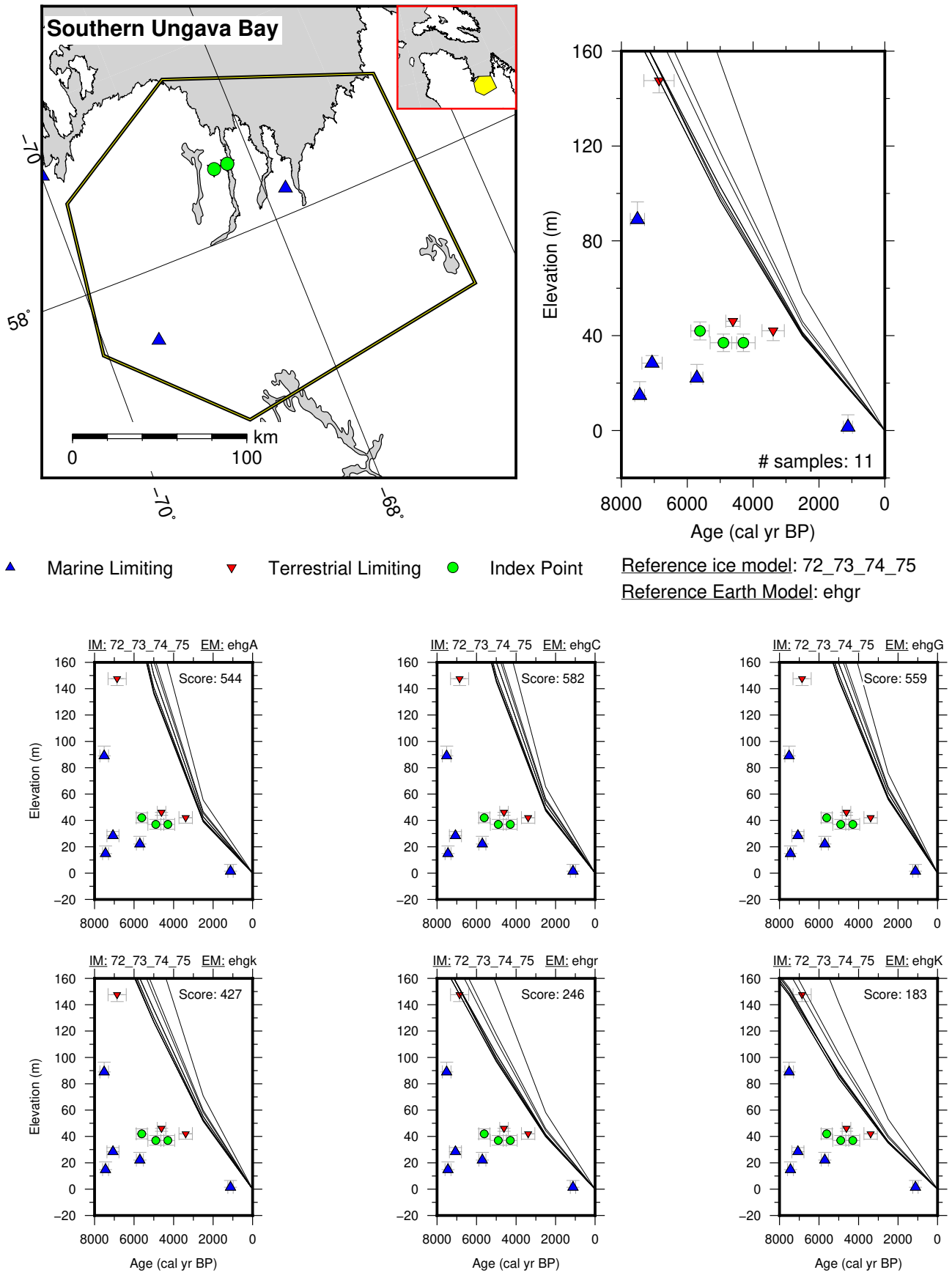


Figure 120: Paleo-sea level and comparison of six models for subregion Hudson Strait, location Southern Ungava Bay.

11.5 Labrador

References for the data used in each location.

Torngat: Dyke et al. (2003); Evans and Rogerson (1988); Lowdon and Blake (1975); Martindale et al. (2020); McNeely and Brennan (2005); Savoie and Gangloff (1980); Vacchi et al. (2018)

Nain: Clark and Fitzhugh (1990); Martindale et al. (2020)

Hamilton Inlet: Fitzhugh (1972, 1975); Lowdon and Blake (1975); Martindale et al. (2020); McNeely and Brennan (2005)

Lake Melville: Awadallah and Batterson (1990); Batterson (1996); Jordan (1975); King (1985); Liverman (1997); Lowdon and Blake (1975); Martindale et al. (2020); McNeely and Brennan (2005)

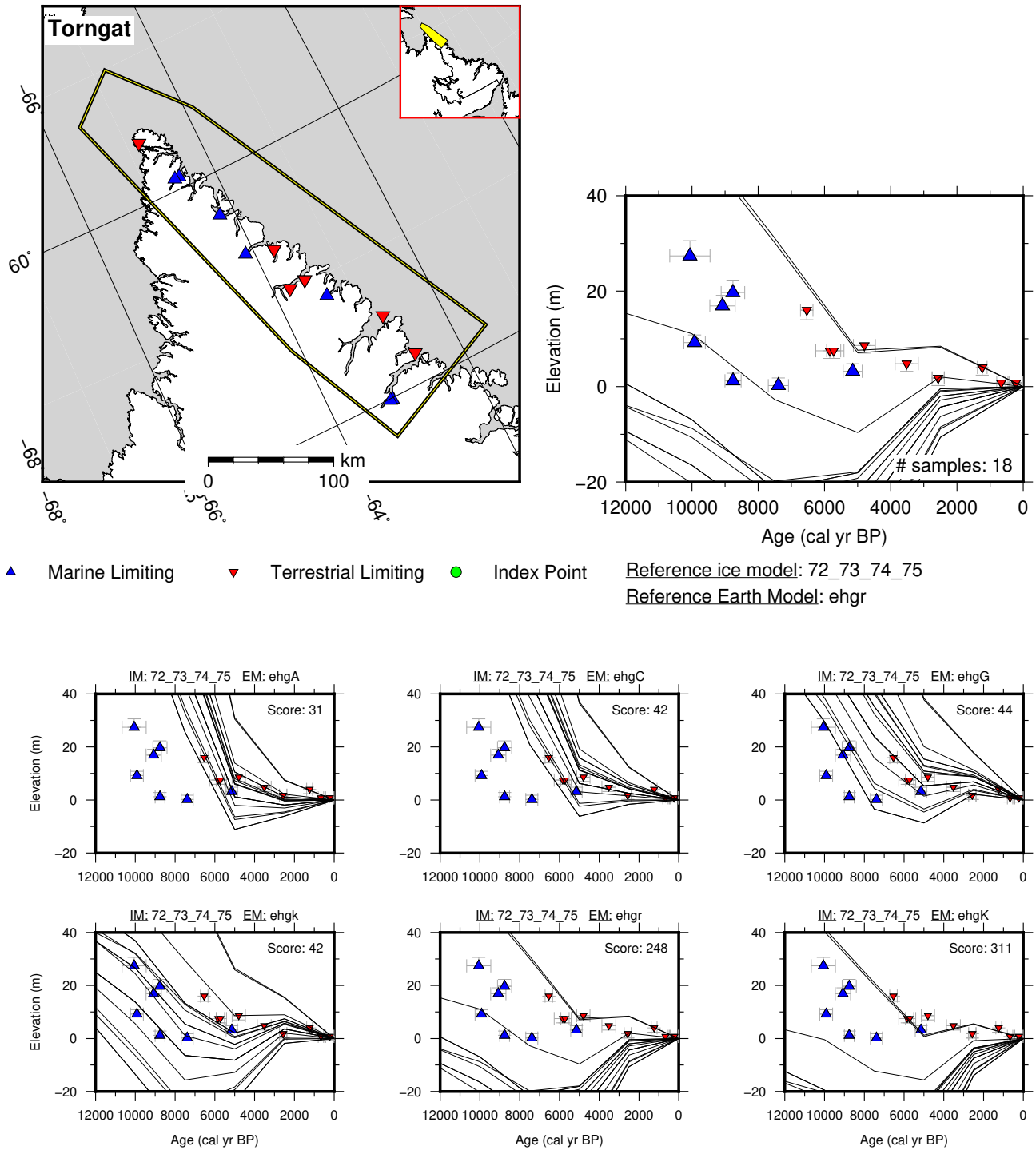


Figure 121: Paleo-sea level and comparison of six models for subregion Labrador, location Torngat.

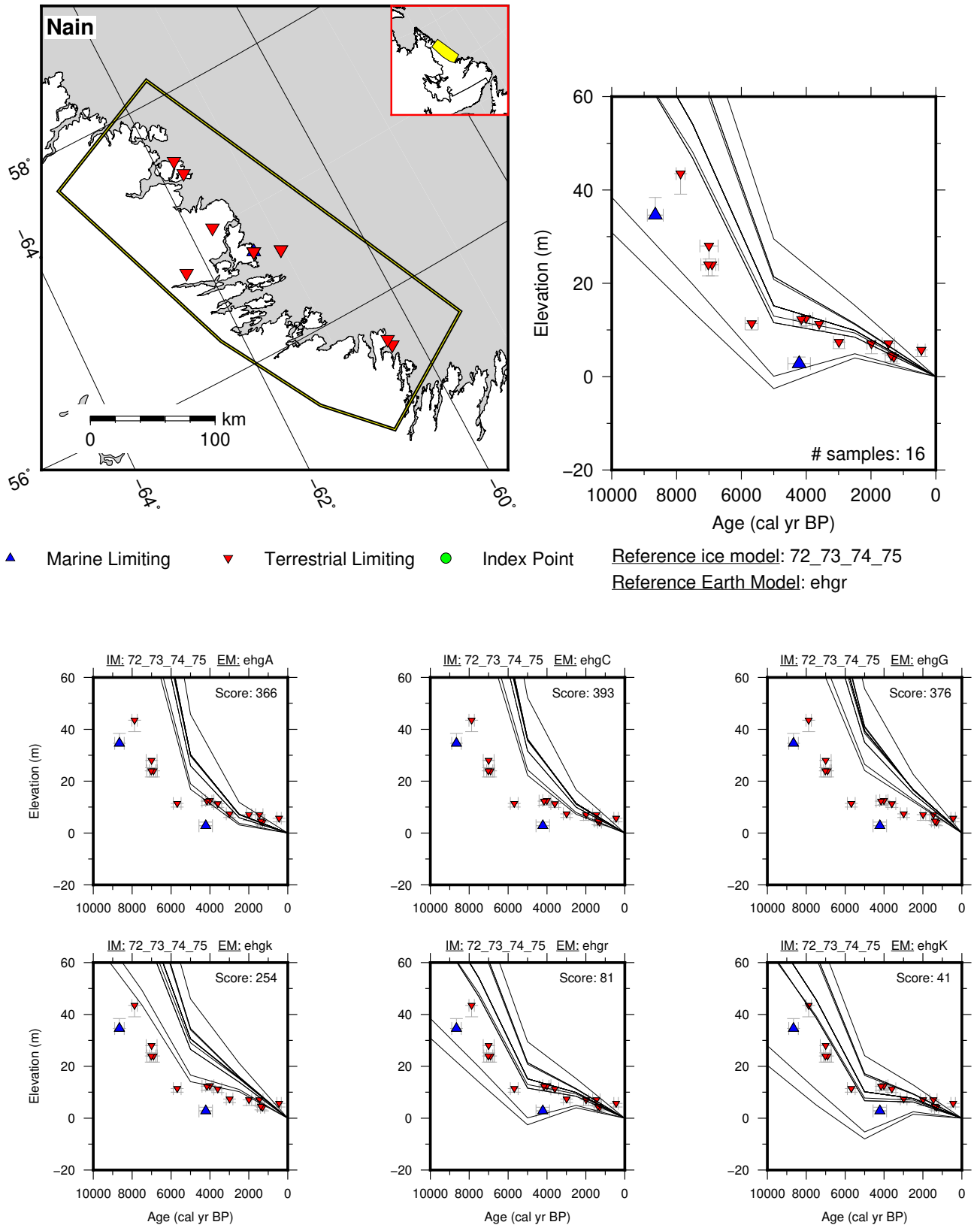


Figure 122: Paleo-sea level and comparison of six models for subregion Labrador, location Nain.

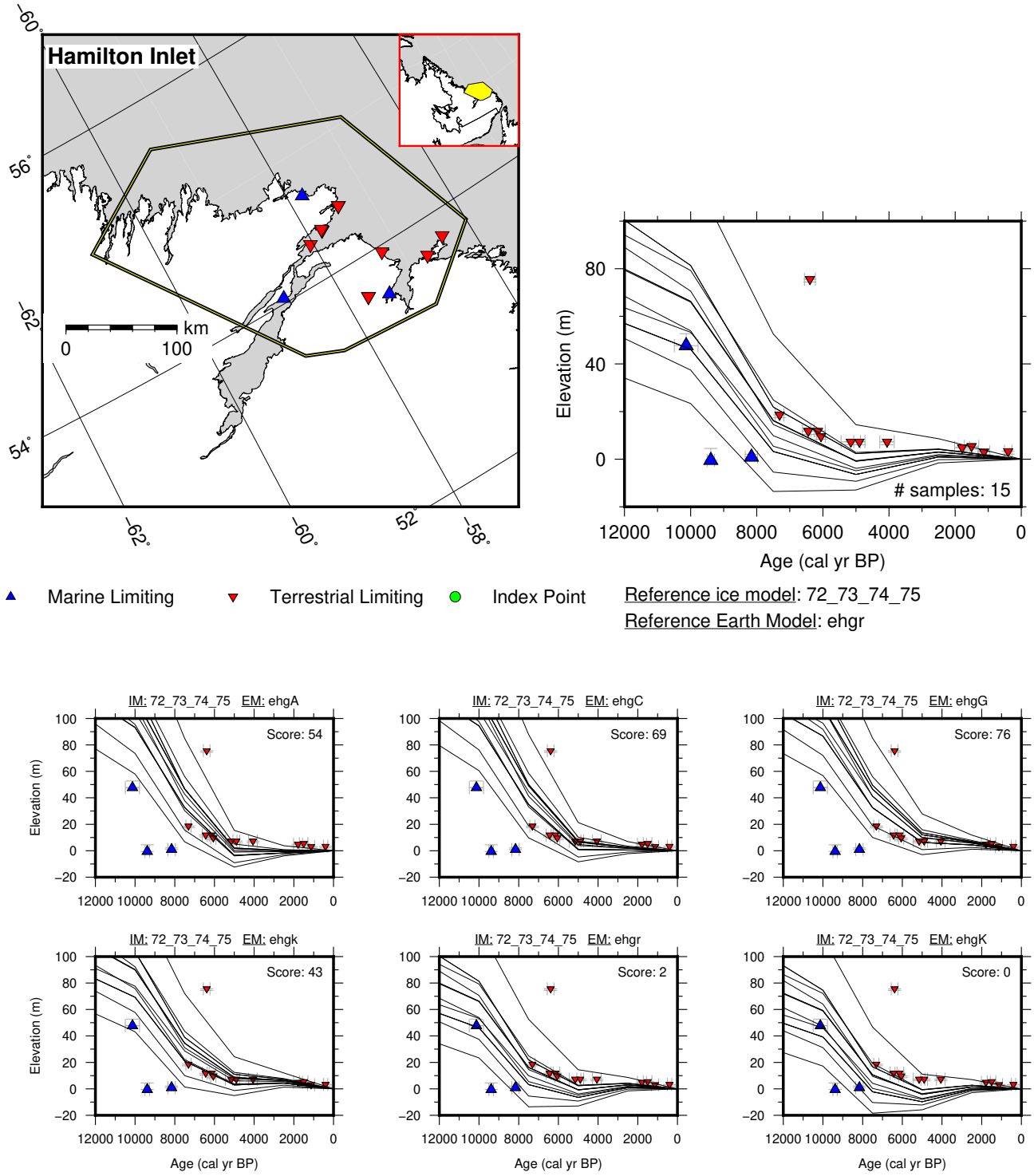


Figure 123: Paleo-sea level and comparison of six models for subregion Labrador, location Hamilton Inlet.

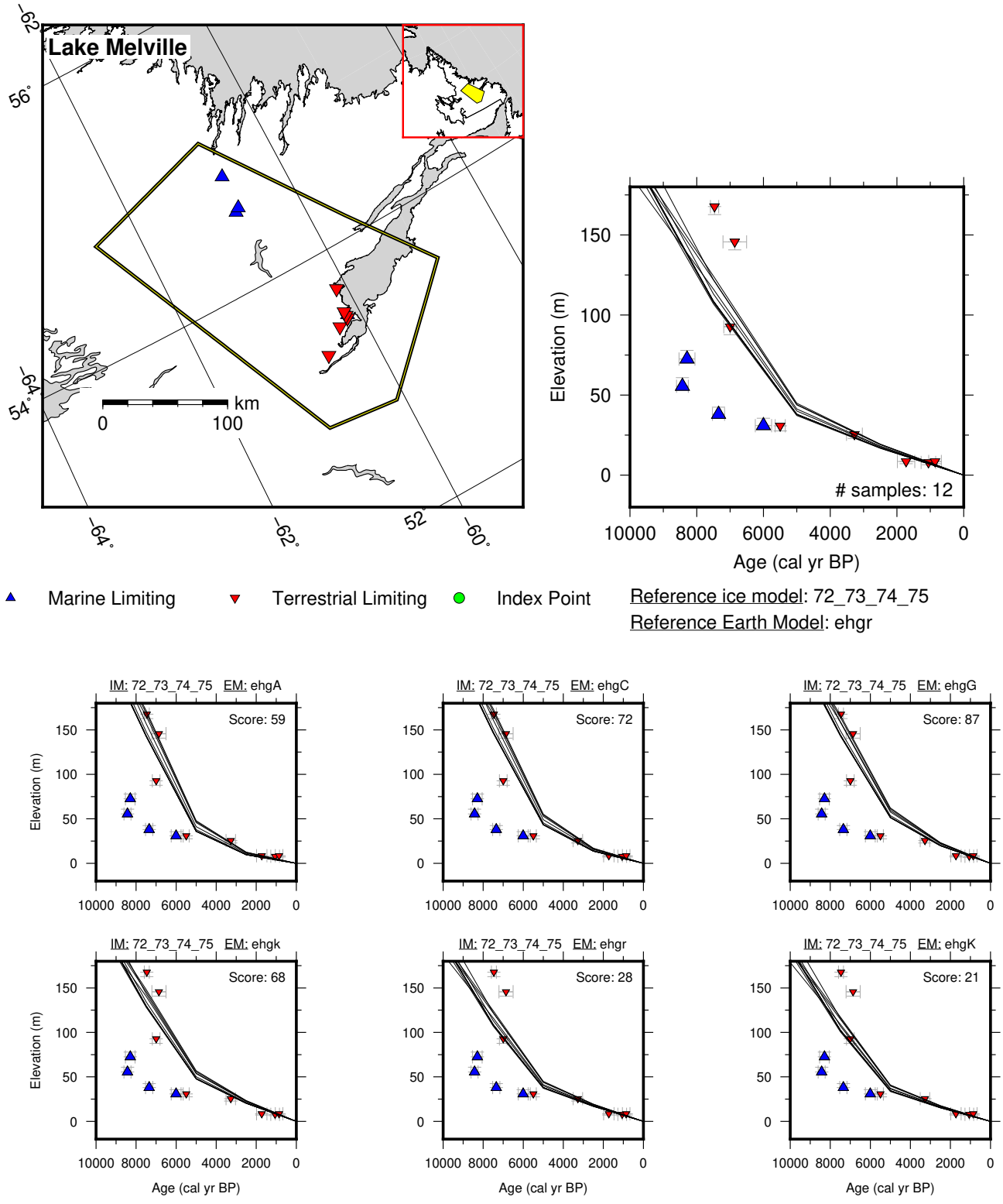


Figure 124: Paleo-sea level and comparison of six models for subregion Labrador, location Lake Melville.

11.6 Maritimes

References for the data used in each location.

Sable Island: Amos and Miller (1990); Scott et al. (1984, 1989); Vacchi et al. (2018)

Halifax: Blake (1988); Edgecombe et al. (1999); Gehrels et al. (2004, 2005); Miller et al. (1982); Scott and Medioli (1982); Scott et al. (1995); Shaw et al. (1993)

Shelburne: Blake (1983); Lowdon and Blake (1970); Scott and Greenberg (1983)

Cumberland: Dalrymple and Zaitlin (1994); Scott and Greenberg (1983); Shaw et al. (2010); Stea and Wightman (1987); Stuckenrath et al. (1966)

Passamaquoddy Bay: Blake (1984); Gehrels et al. (2004); Martindale et al. (2020); McNeely (2005); Miller (1990); Nicks (1991); Rampton et al. (1984); Seaman (2004); Stea and Mott (1998)

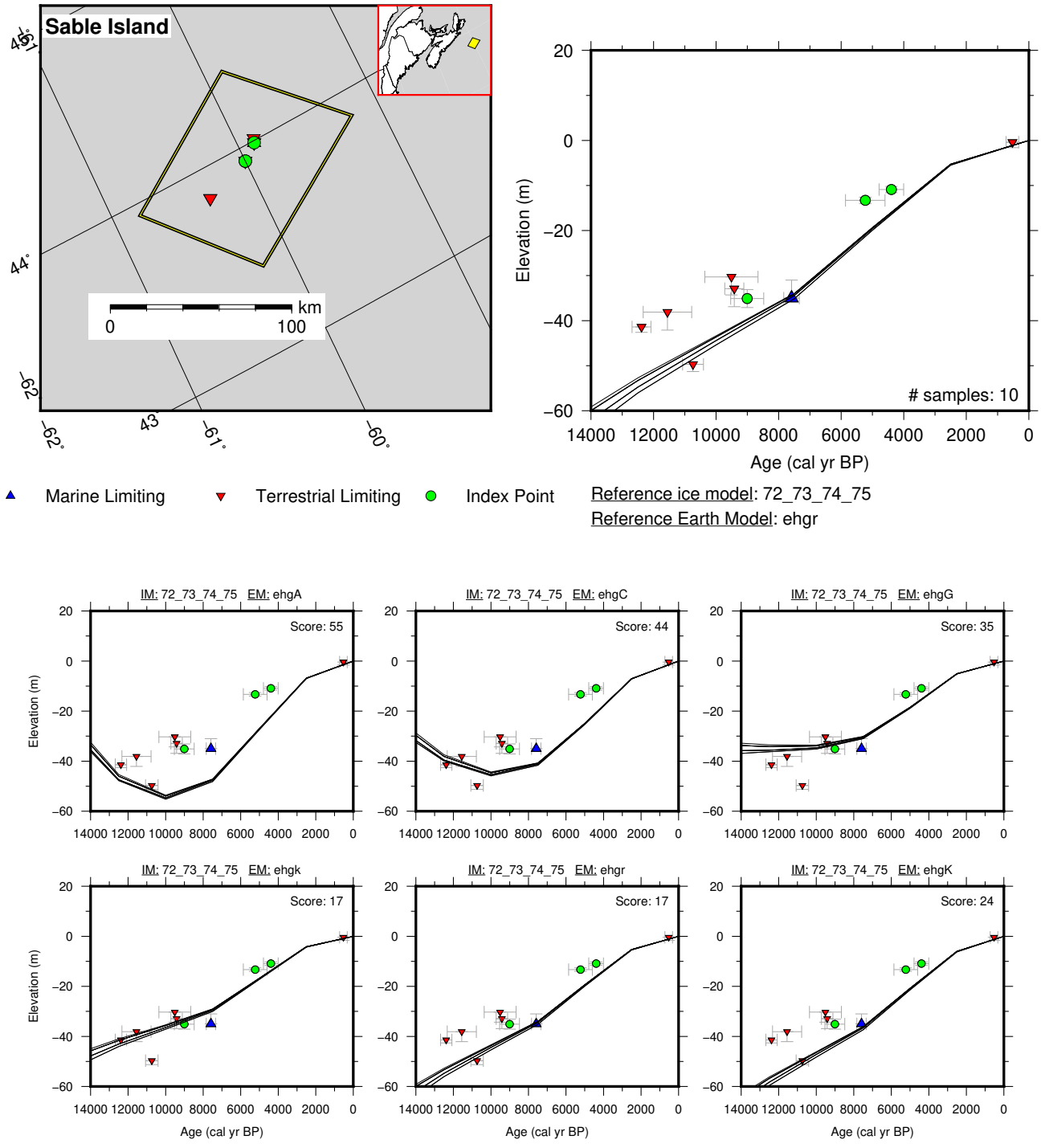


Figure 125: Paleo-sea level and comparison of six models for subregion Maritimes, location Sable Island.

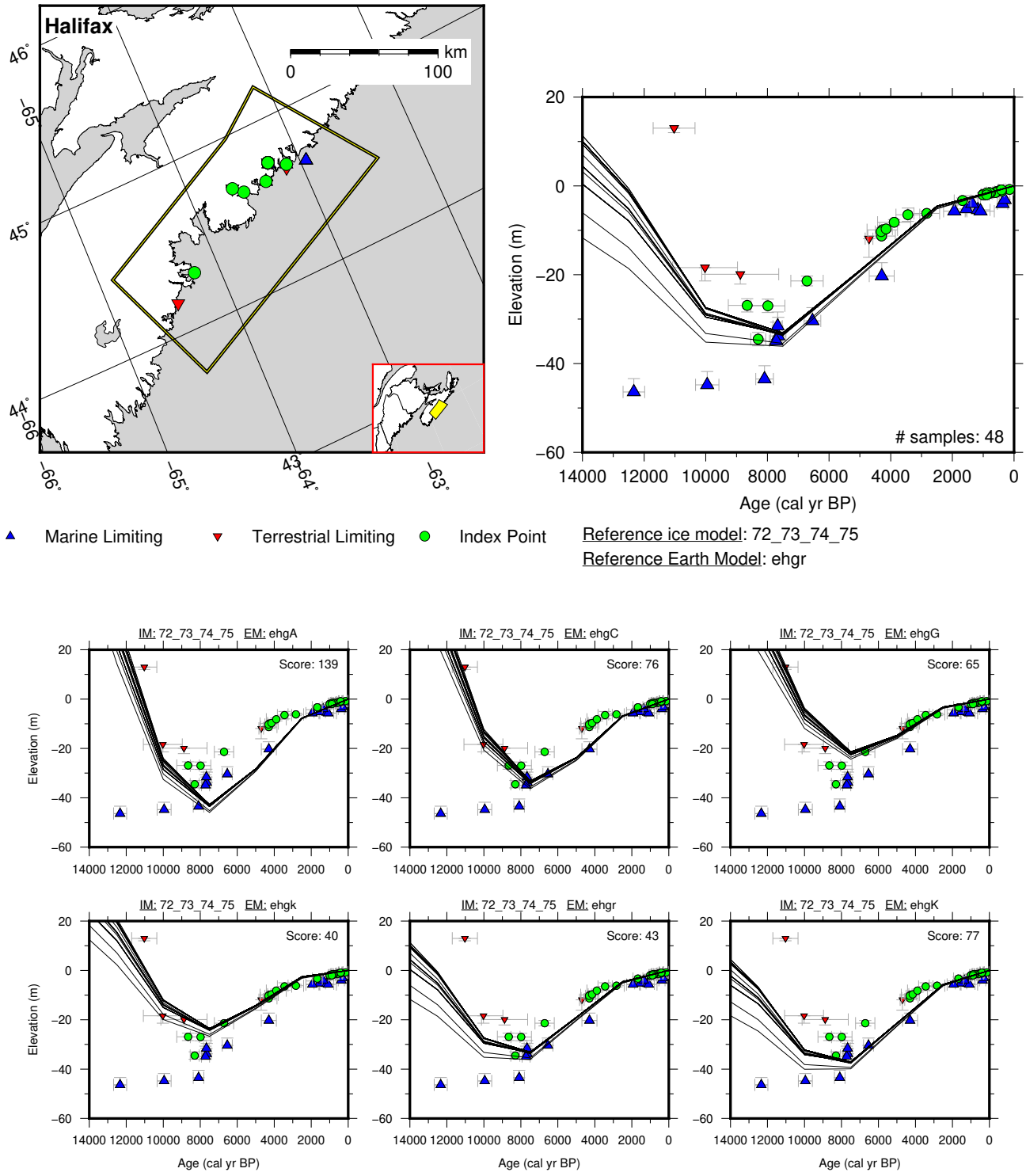


Figure 126: Paleo-sea level and comparison of six models for subregion Maritimes, location Halifax.

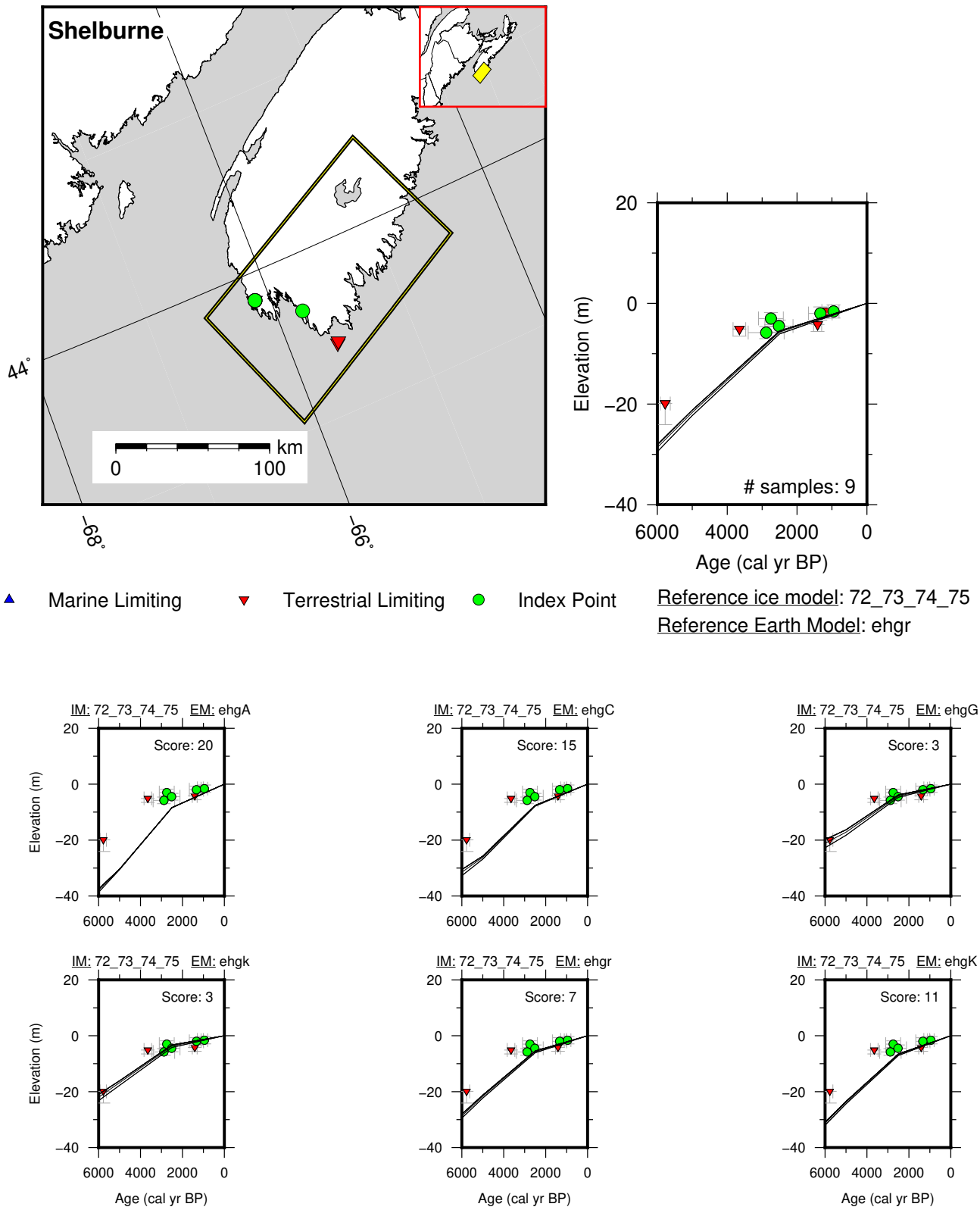


Figure 127: Paleo-sea level and comparison of six models for subregion Maritimes, location Shelburne.

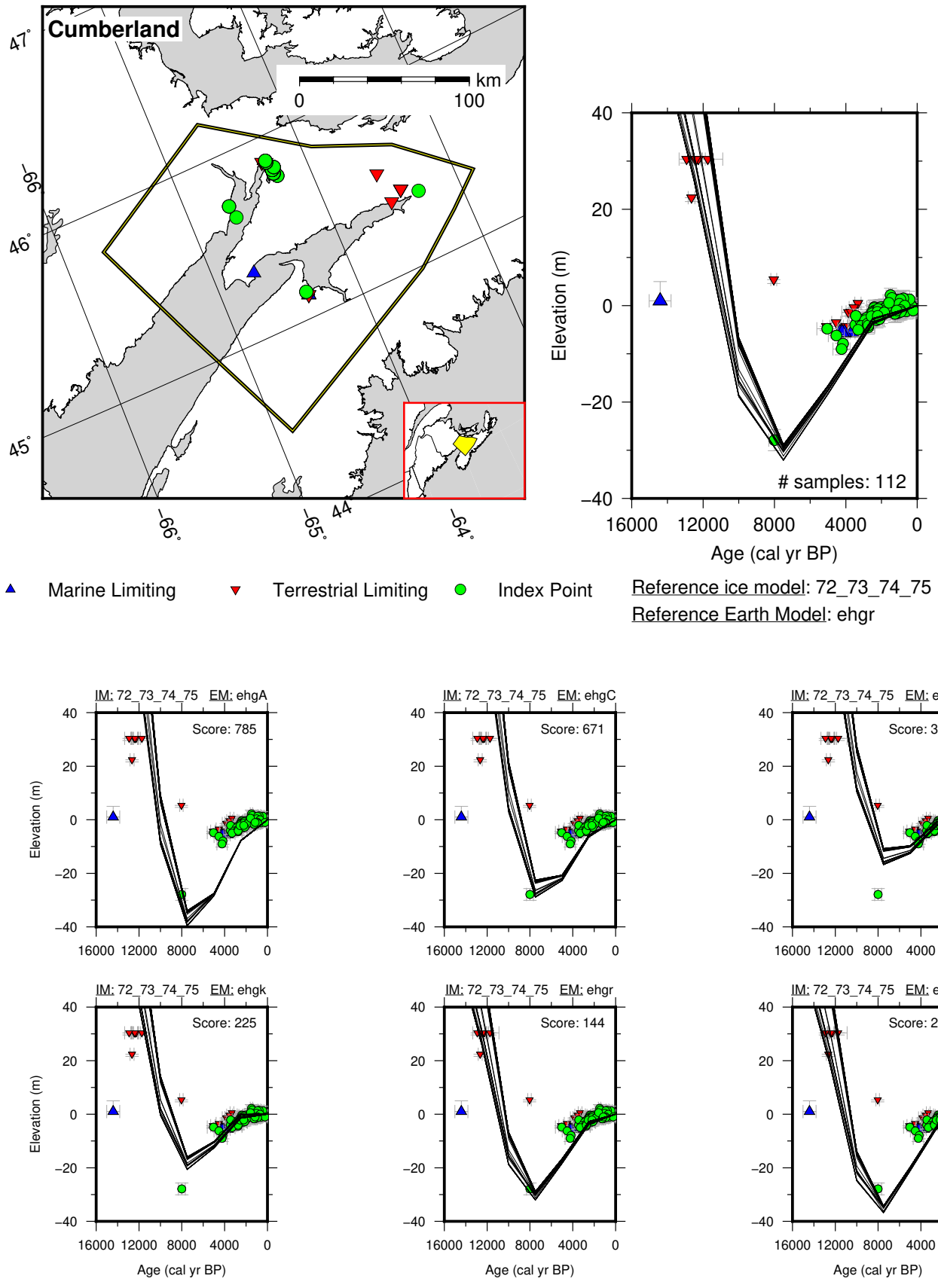


Figure 128: Paleo-sea level and comparison of six models for subregion Maritimes, location Cumberland.

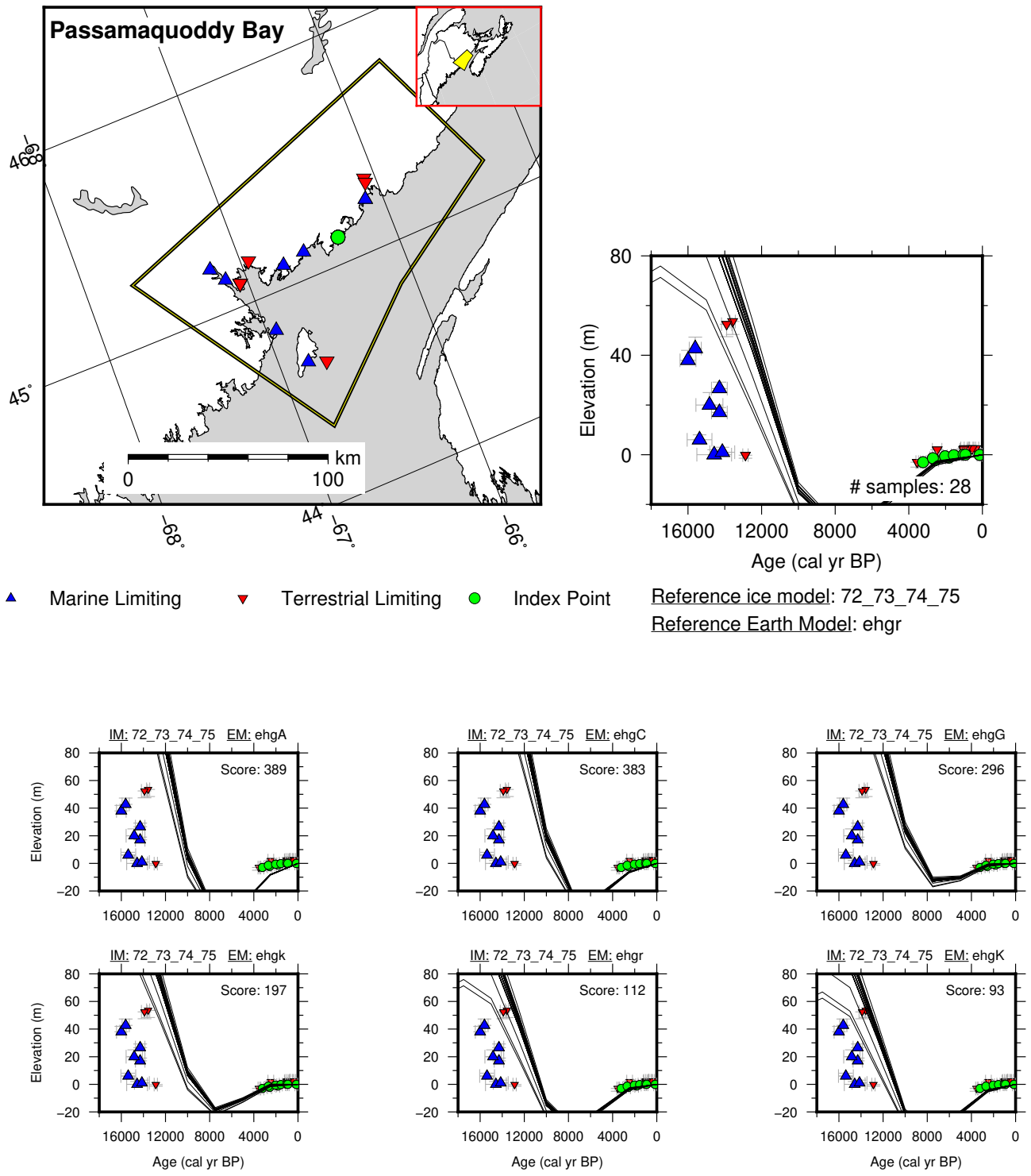


Figure 129: Paleo-sea level and comparison of six models for subregion Maritimes, location Passamaquoddy Bay.

11.7 Newfoundland

References for the data used in each location.

Great Northern Peninsula: Bell et al. (2005); Grant (1992, 1994); Martindale et al. (2020); McNeely and Jorgensen (1993); McNeely and McCuaig (1991); Nydal (1989); Tuck (1971)

Notre Dame Bay: Blake (1983); Daly et al. (2007); Dyck and Fyles (1963); McNeely and Brennan (2005); McNeely and McCuaig (1991); Scott et al. (1991); Shaw and Edwardson (1994)

Avalon Peninsula: Catto et al. (1997); Daly et al. (2007); MacPherson (1996); McNeely (2006); Shaw and Forbes (1995)

Bay Of Islands: Brookes et al. (1985); Brookes and Stevens (1985); Daly et al. (2007); Grant (1994); McNeely and Brennan (2005); McNeely and McCuaig (1991)

Port Aux Basques: Bell et al. (2003); Blake (1988); Brookes et al. (1985); Daly et al. (2007); Dyke et al. (2003); Forbes et al. (1993); Kemp et al. (2017); Lowdon and Blake (1980); Lowdon et al. (1971); McNeely (2002); McNeely and Atkinson (1995); McNeely and Brennan (2005); McNeely and Jorgensen (1992, 1993); McNeely and McCuaig (1991); Shaw and Forbes (1987, 1995); Shaw and Potter (2015)

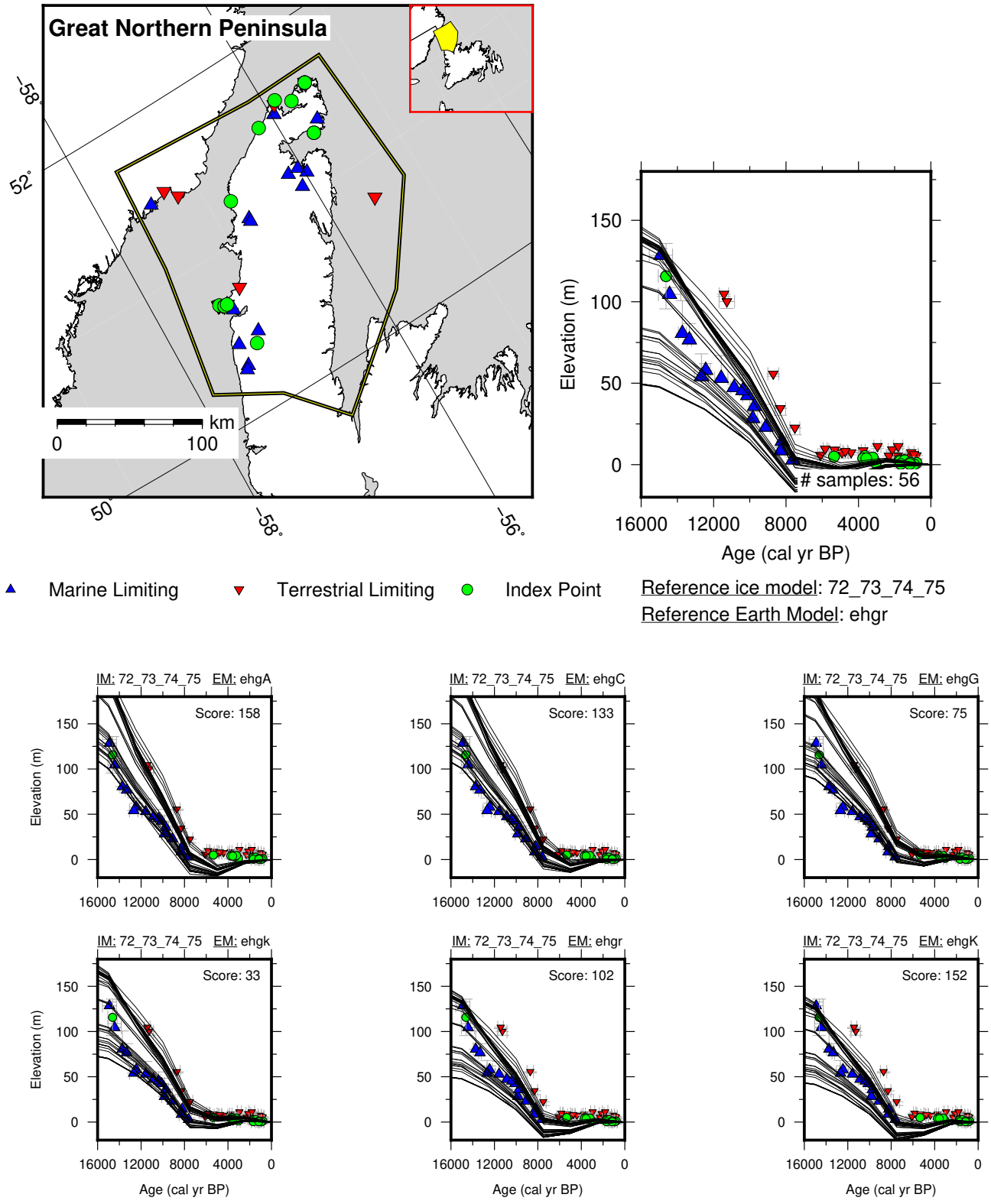


Figure 130: Paleo-sea level and comparison of six models for subregion Newfoundland, location Great Northern Peninsula.

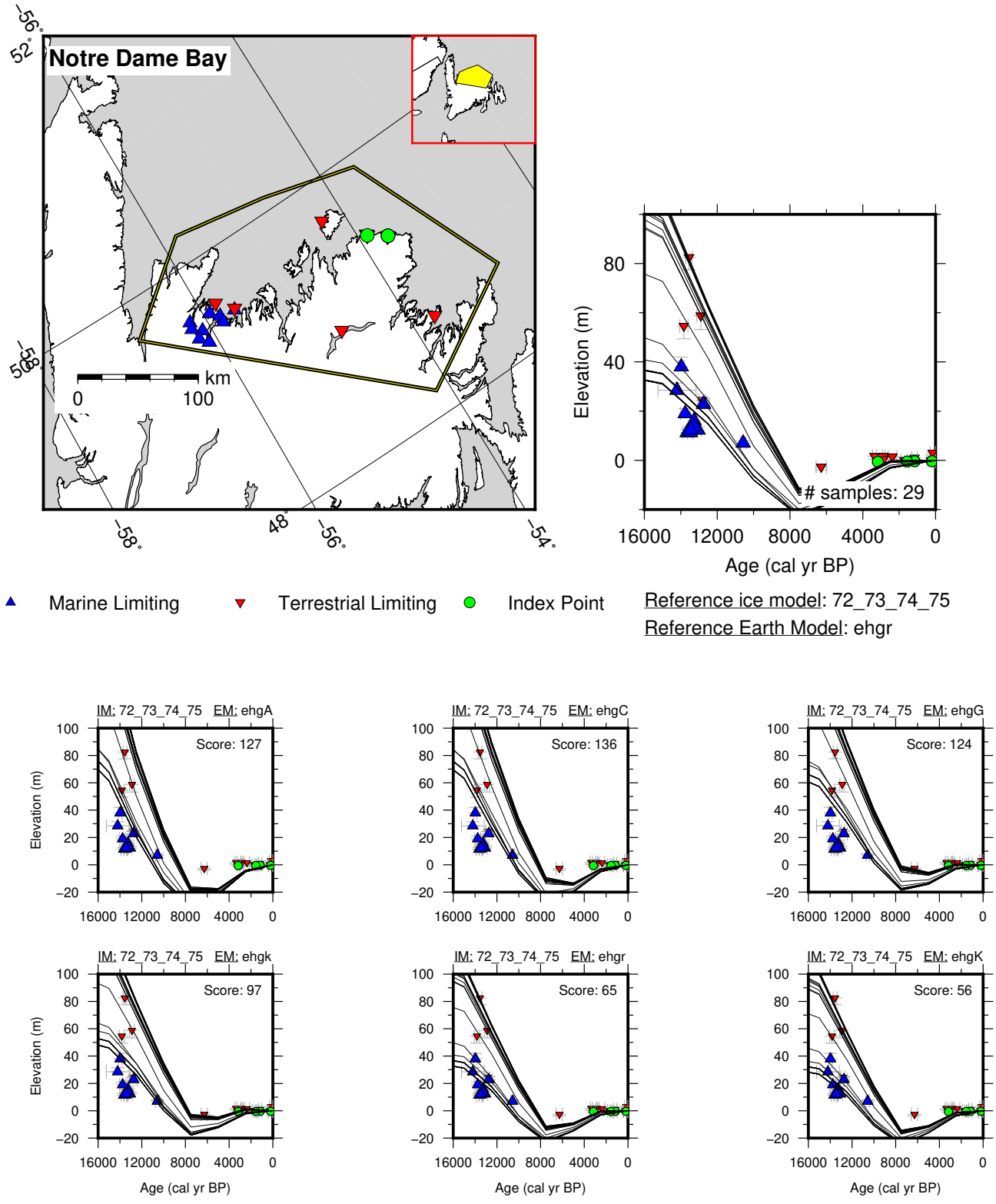


Figure 131: Paleo-sea level and comparison of six models for subregion Newfoundland, location Notre Dame Bay.

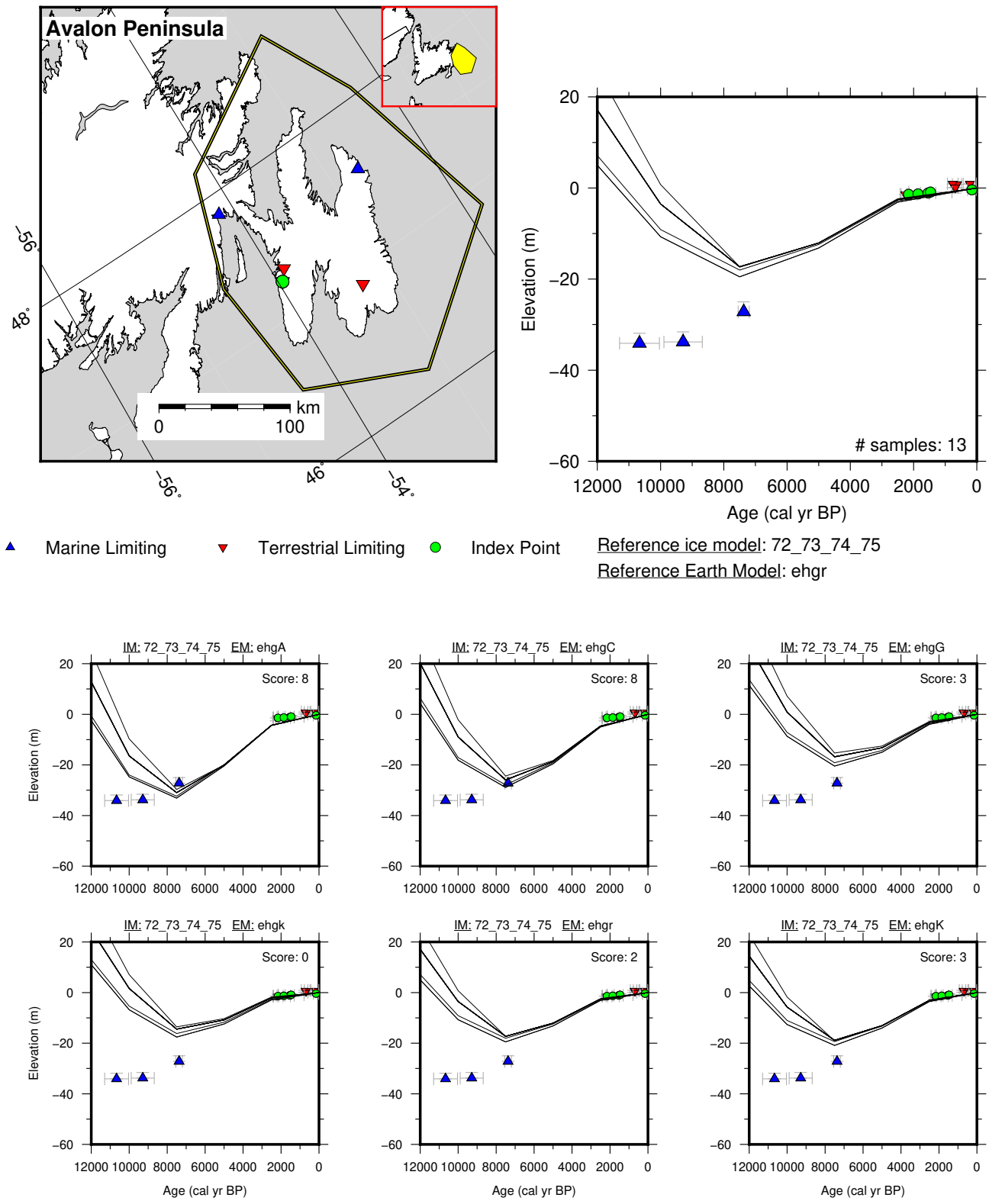


Figure 132: Paleo-sea level and comparison of six models for subregion Newfoundland, location Avalon Peninsula.

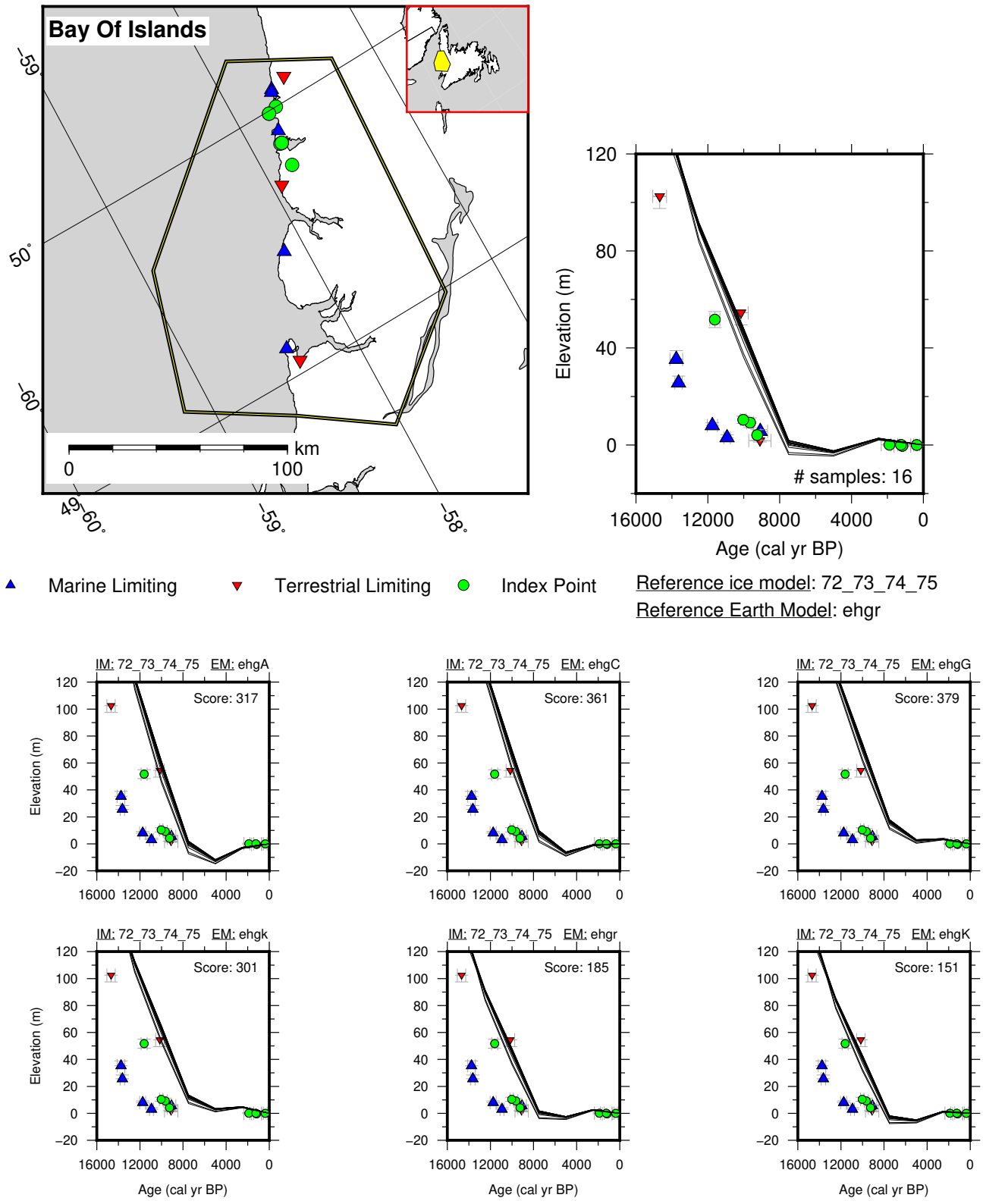


Figure 133: Paleo-sea level and comparison of six models for subregion Newfoundland, location Bay Of Islands.

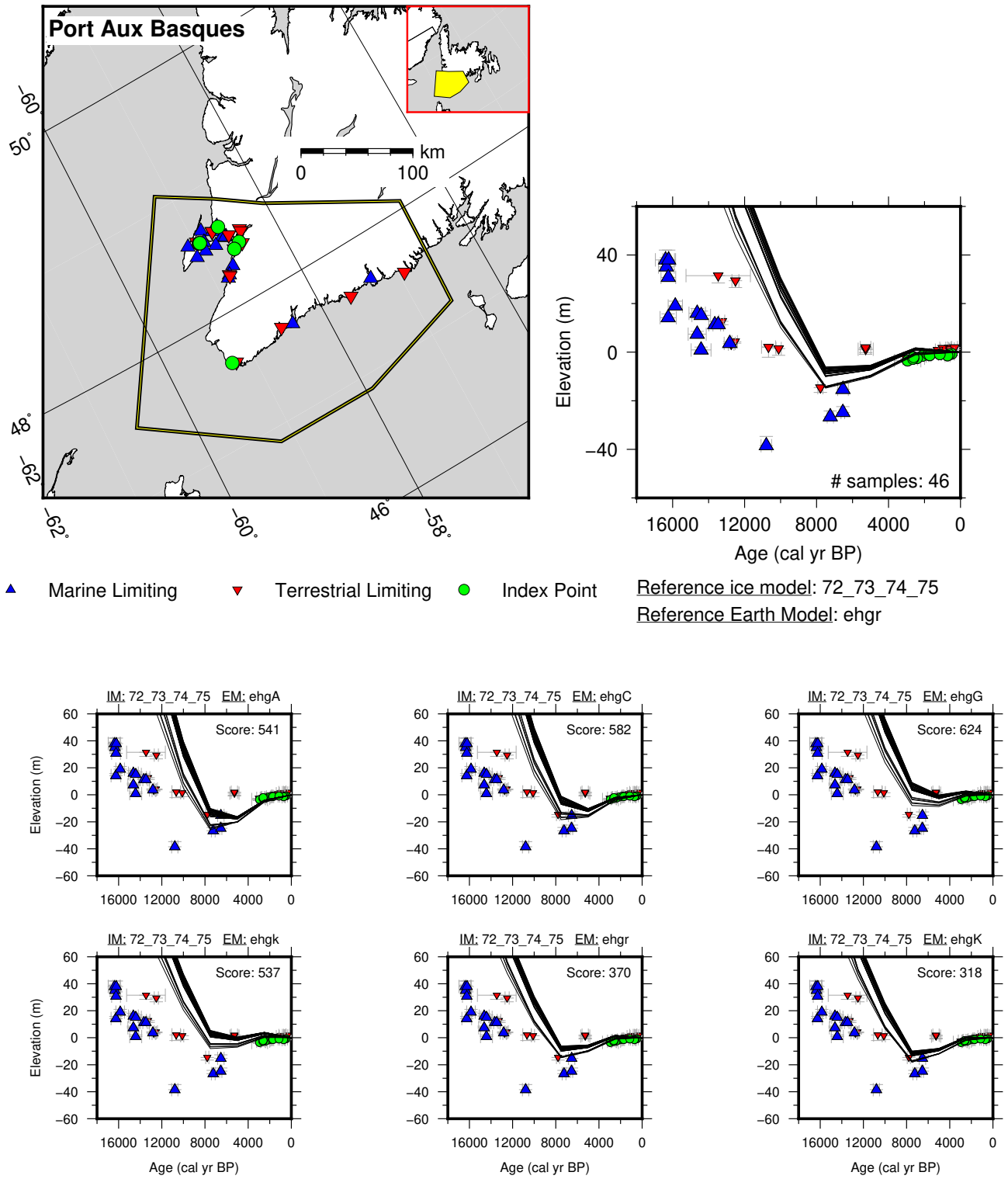


Figure 134: Paleo-sea level and comparison of six models for subregion Newfoundland, location Port Aux Basques.

11.8 Northeastern United States

References for the data used in each location.

Eastern Maine: Belknap et al. (1989); Gehrels (1999); Gehrels and Belknap (1993); Gehrels et al. (1996)

Southern Maine: Barnhardt et al. (1995); Belknap et al. (1989); Bloom (1963); Gehrels et al. (1996, 2002); Kelley et al. (1992, 1995)

Northern Massachusetts: Donnelly (2006); Kaye and Barghoorn (1964); Kirwan et al. (2011); Newman et al. (1980); Oldale et al. (1993); Redfield (1967); Redfield and Rubin (1962)

Southern Massachusetts: Emery et al. (1967); Field et al. (1979); Gutierrez et al. (2003); Oldale and O'Hara (1980); Redfield (1967); Redfield and Rubin (1962); Stuiver et al. (1963)

Connecticut: Bloom (1963); Cinquemani et al. (1982); Donnelly et al. (2004); Nydick et al. (1995); Redfield and Rubin (1962); van de Plassche (1991); van de Plassche et al. (1989, 1998, 2002)

Long Island: Bloom (1963); Cinquemani et al. (1982); Field et al. (1979); Pardi and Newman (1980); Pardi et al. (1984); Redfield (1967); Redfield and Rubin (1962)

New York: Olson and Broecker (1961); Pardi et al. (1984); Slagle et al. (2006)

New Jersey: Cinquemani et al. (1982); Donnelly et al. (2001); Engelhart and Horton (2012); Field et al. (1979); Miller et al. (2009); Pardi et al. (1984); Psuty (1986); Stuiver and Daddario (1963)

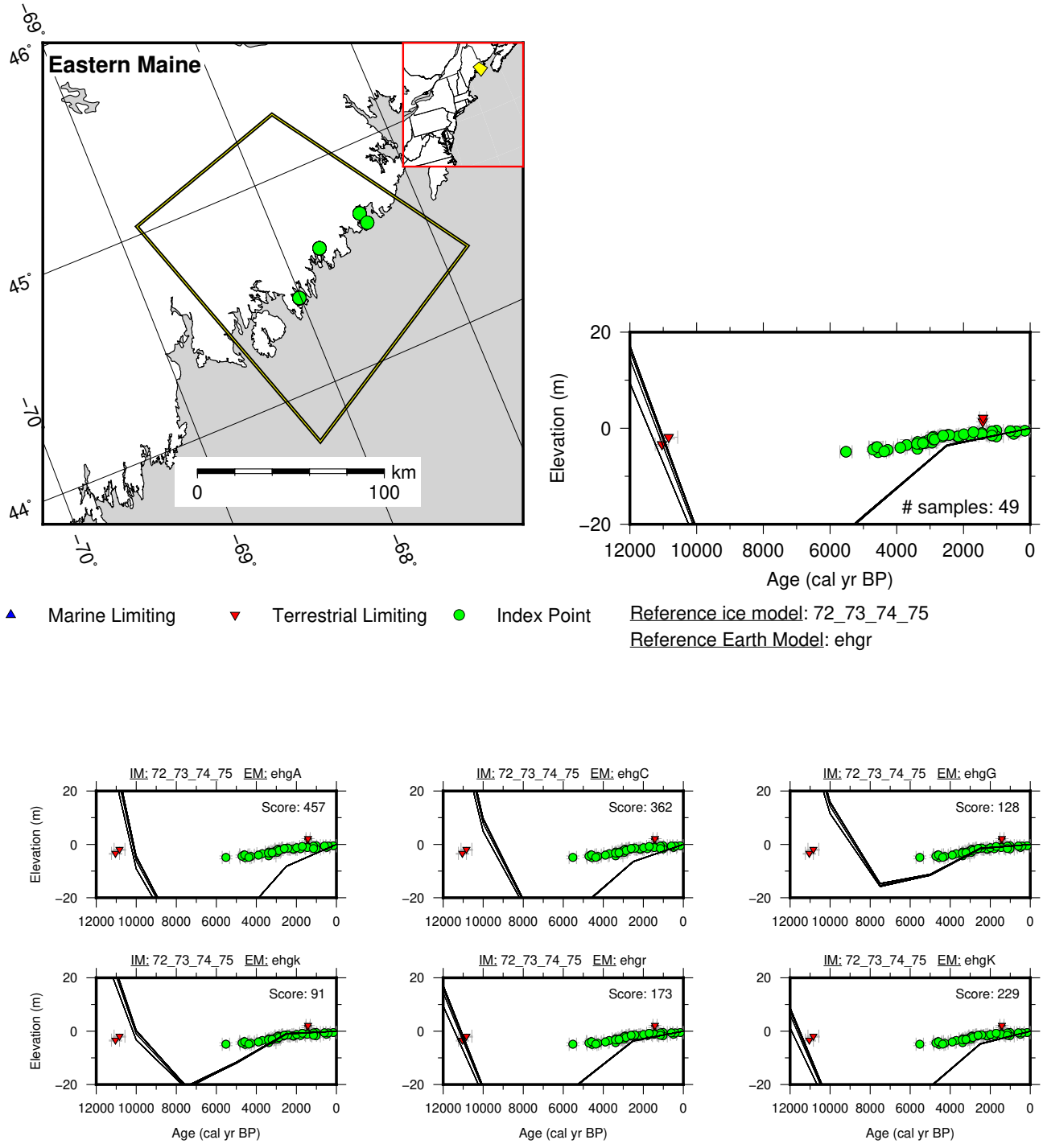


Figure 135: Paleo-sea level and comparison of six models for subregion Northeastern United States, location Eastern Maine.

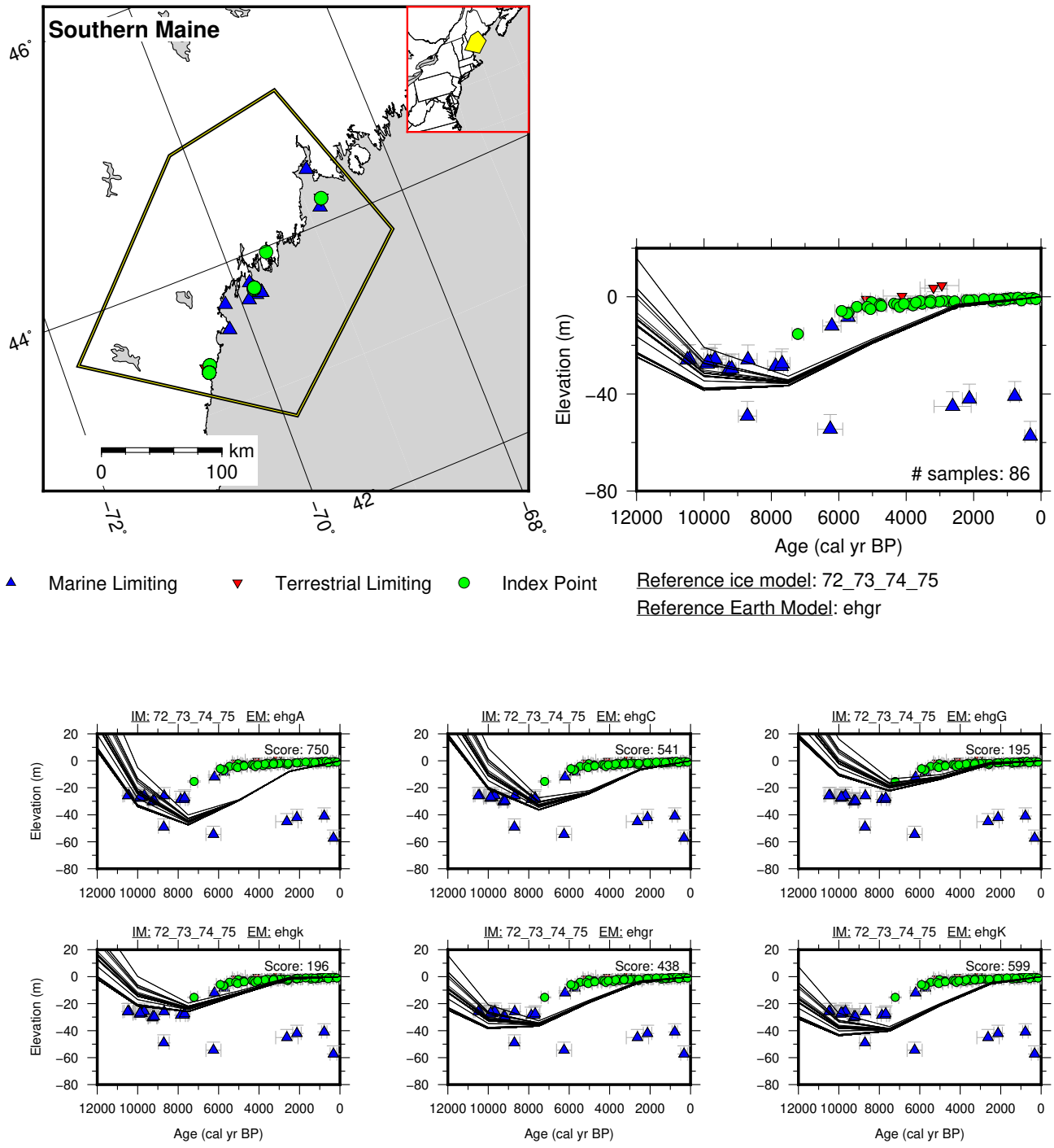


Figure 136: Paleo-sea level and comparison of six models for subregion Northeastern United States, location Southern Maine.

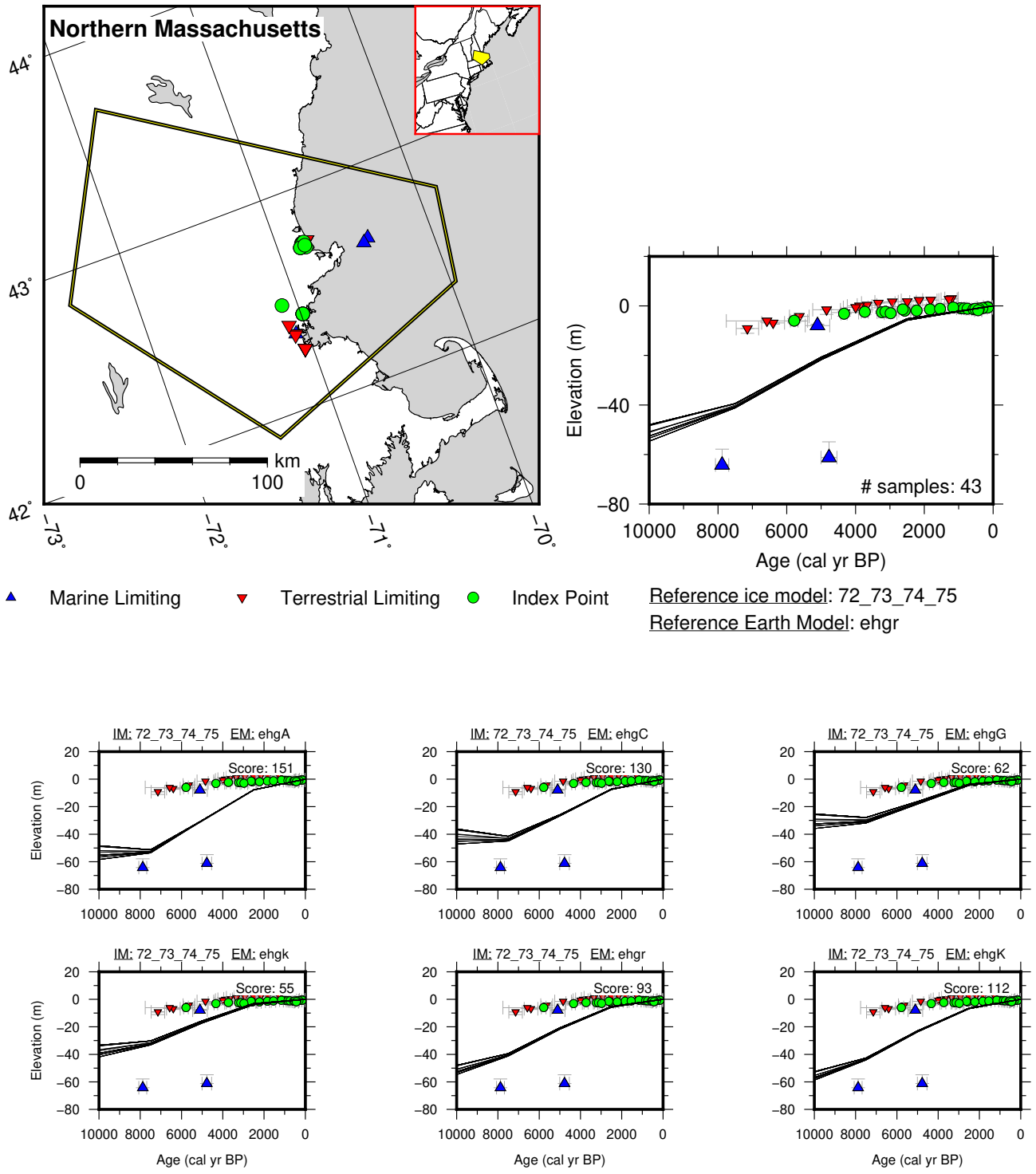


Figure 137: Paleo-sea level and comparison of six models for subregion Northeastern United States, location Northern Massachusetts.

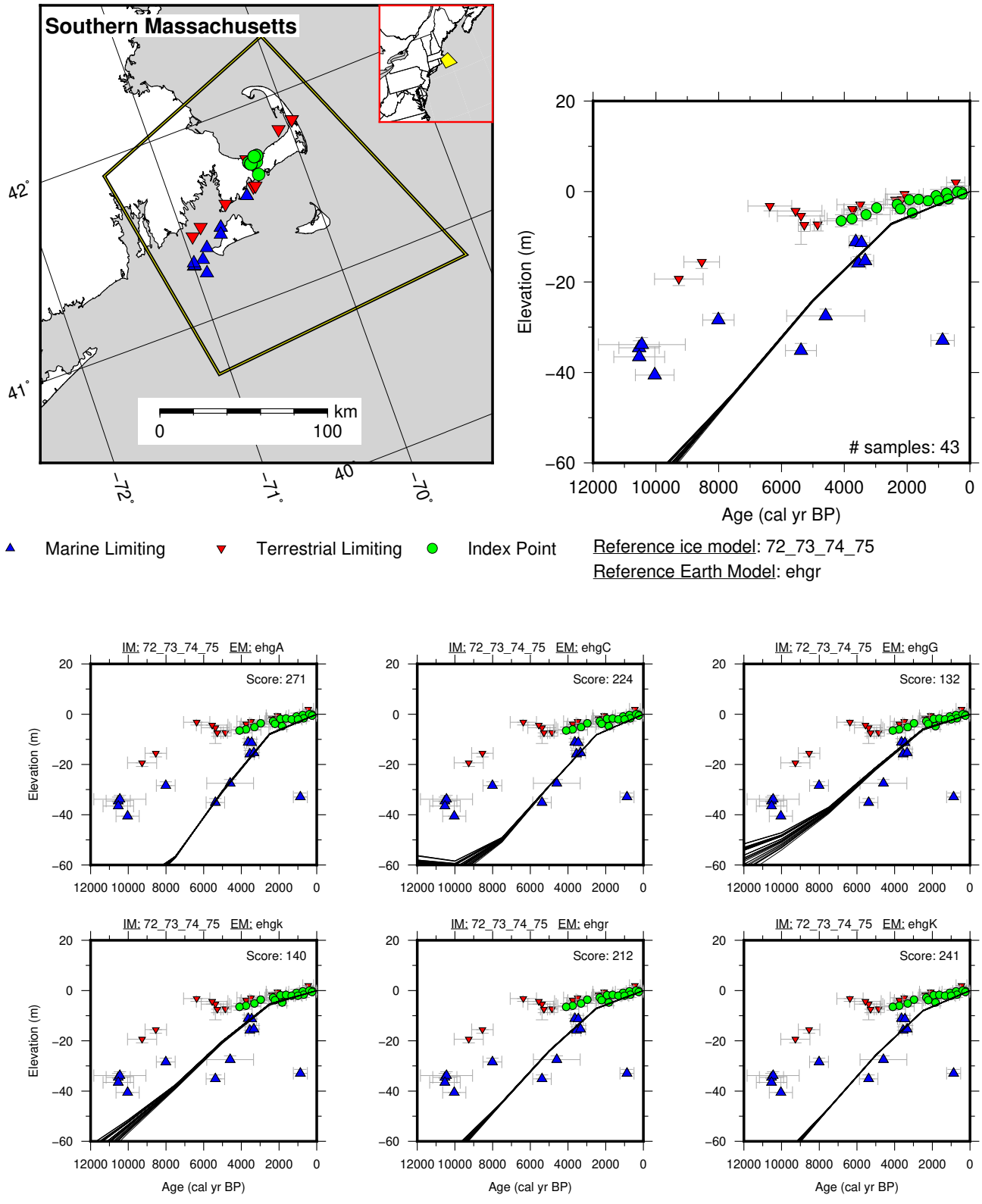
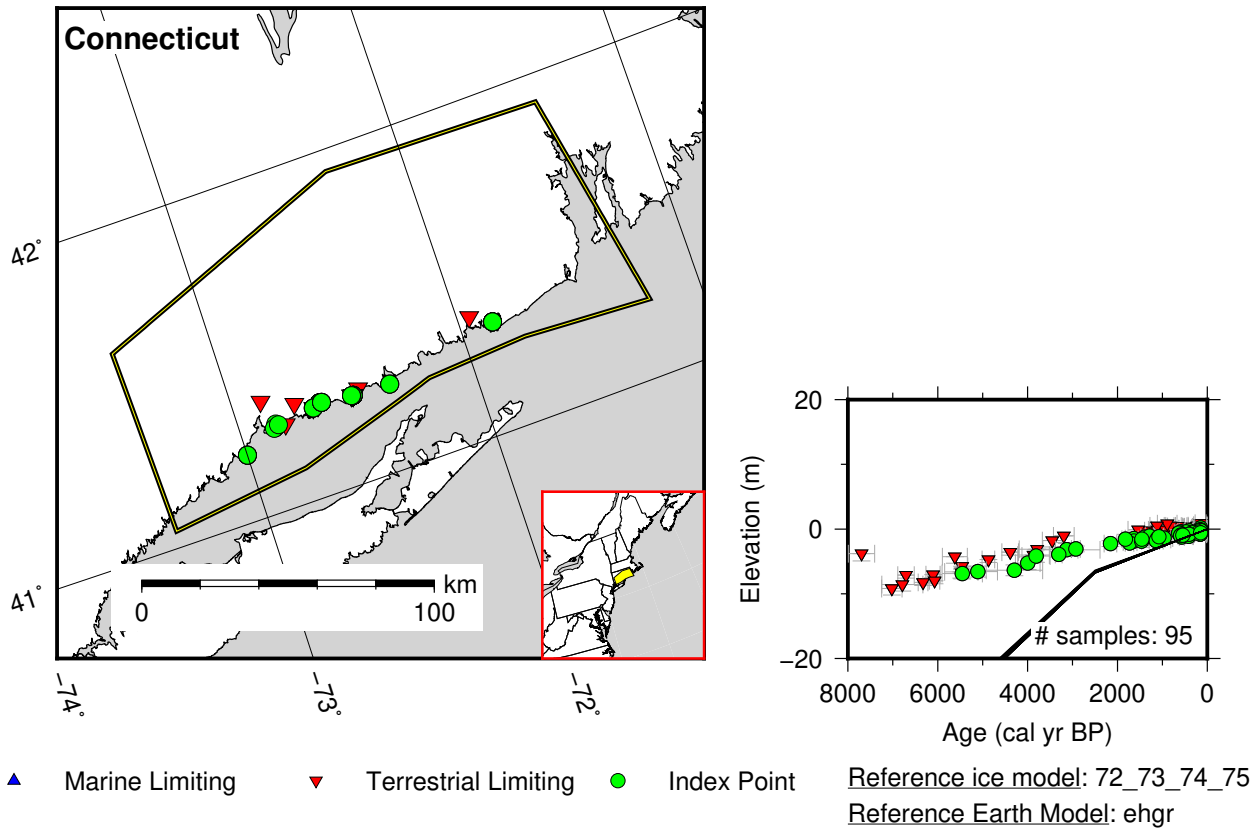


Figure 138: Paleo-sea level and comparison of six models for subregion Northeastern United States, location Southern Massachusetts.



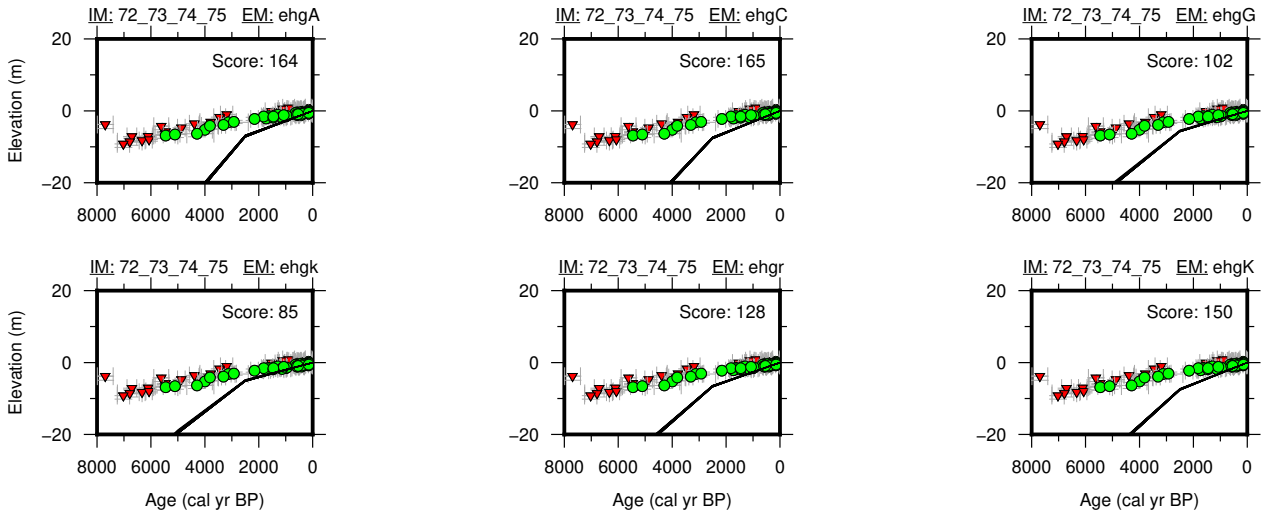
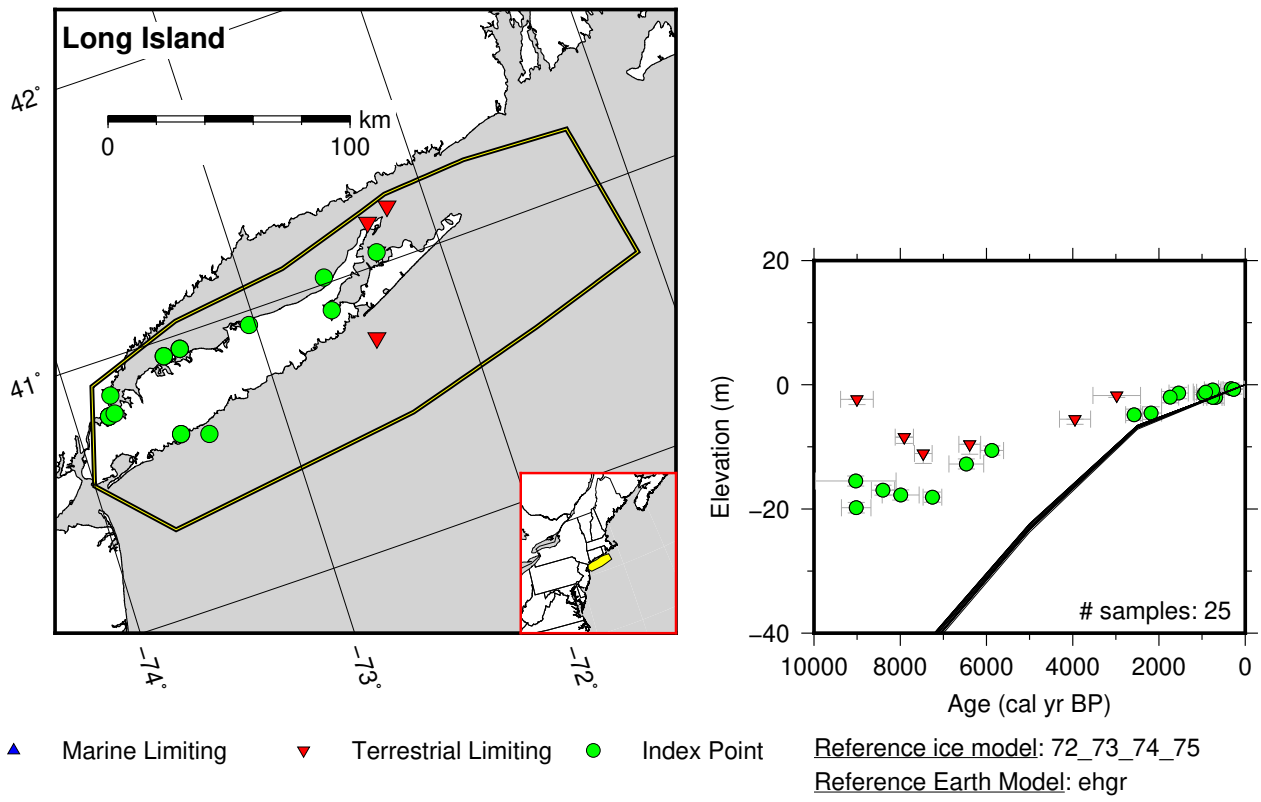


Figure 139: Paleo-sea level and comparison of six models for subregion Northeastern United States, location Connecticut.



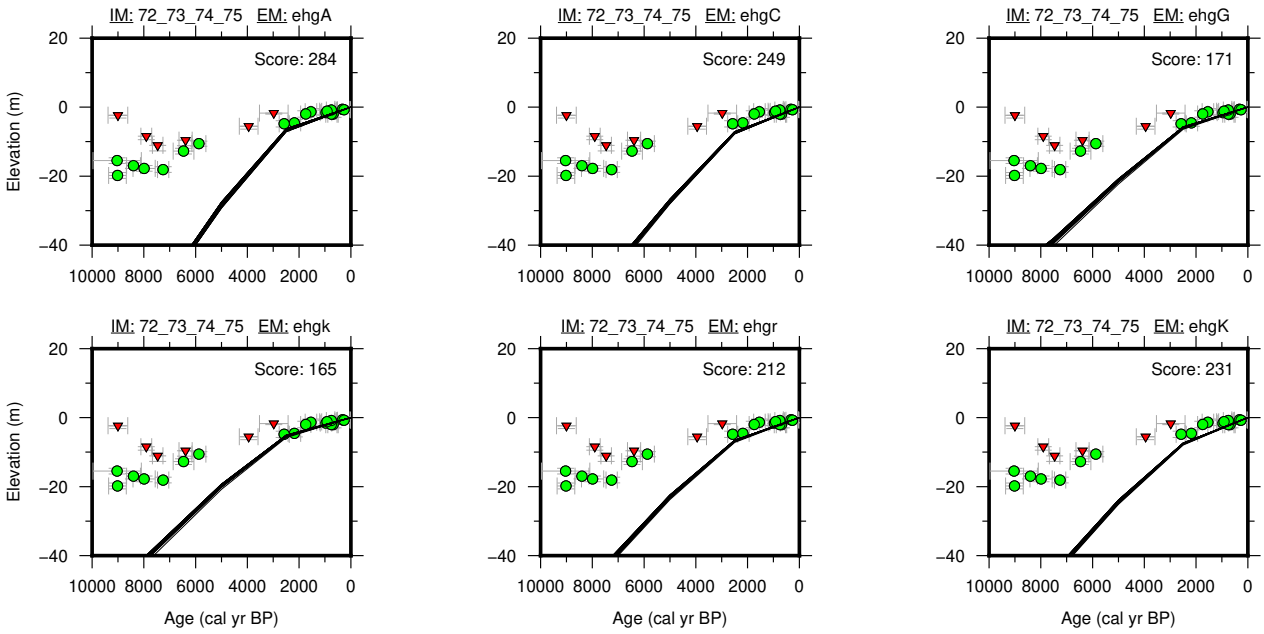


Figure 140: Paleo-sea level and comparison of six models for subregion Northeastern United States, location Long Island.

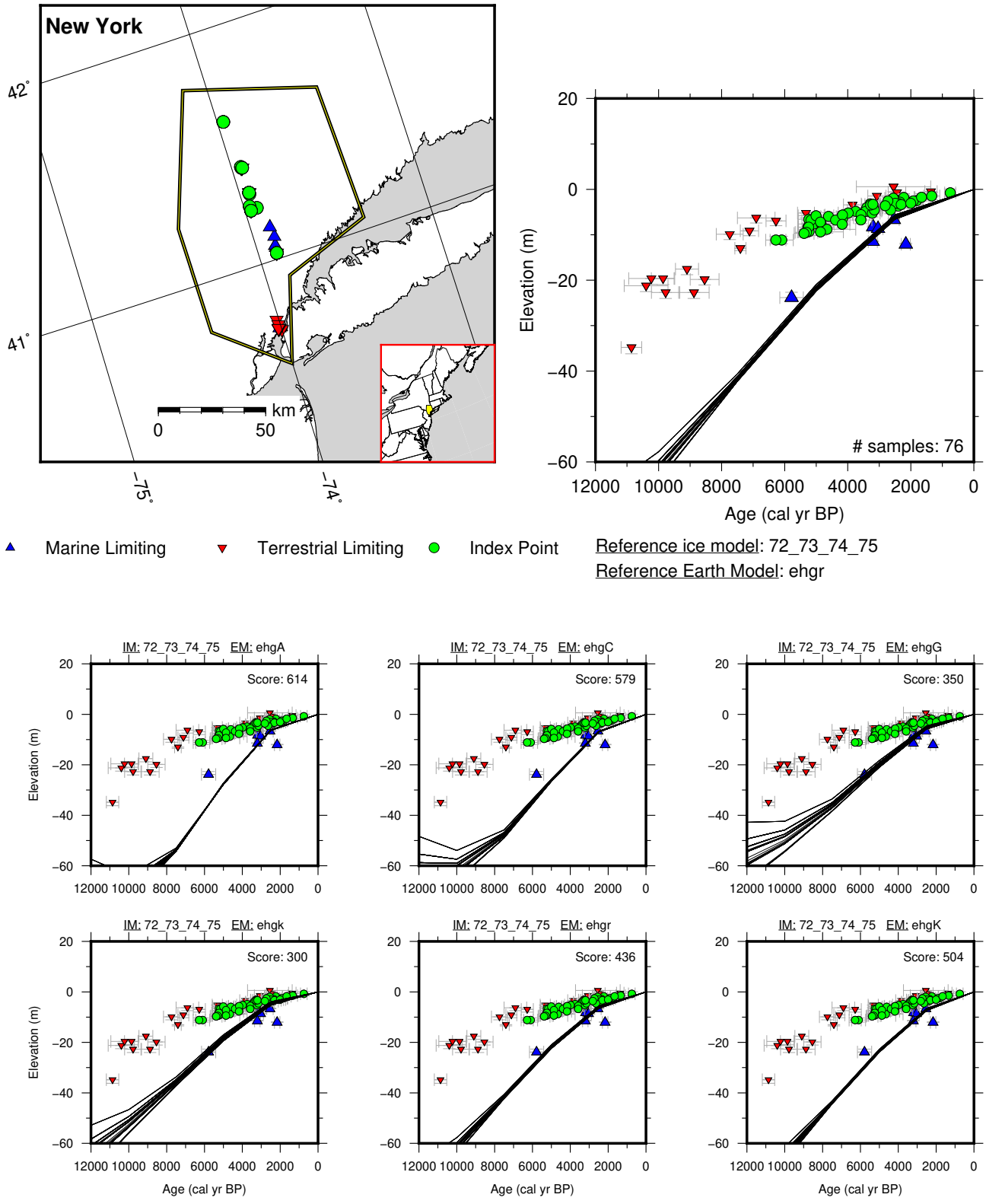


Figure 141: Paleo-sea level and comparison of six models for subregion Northeastern United States, location New York.

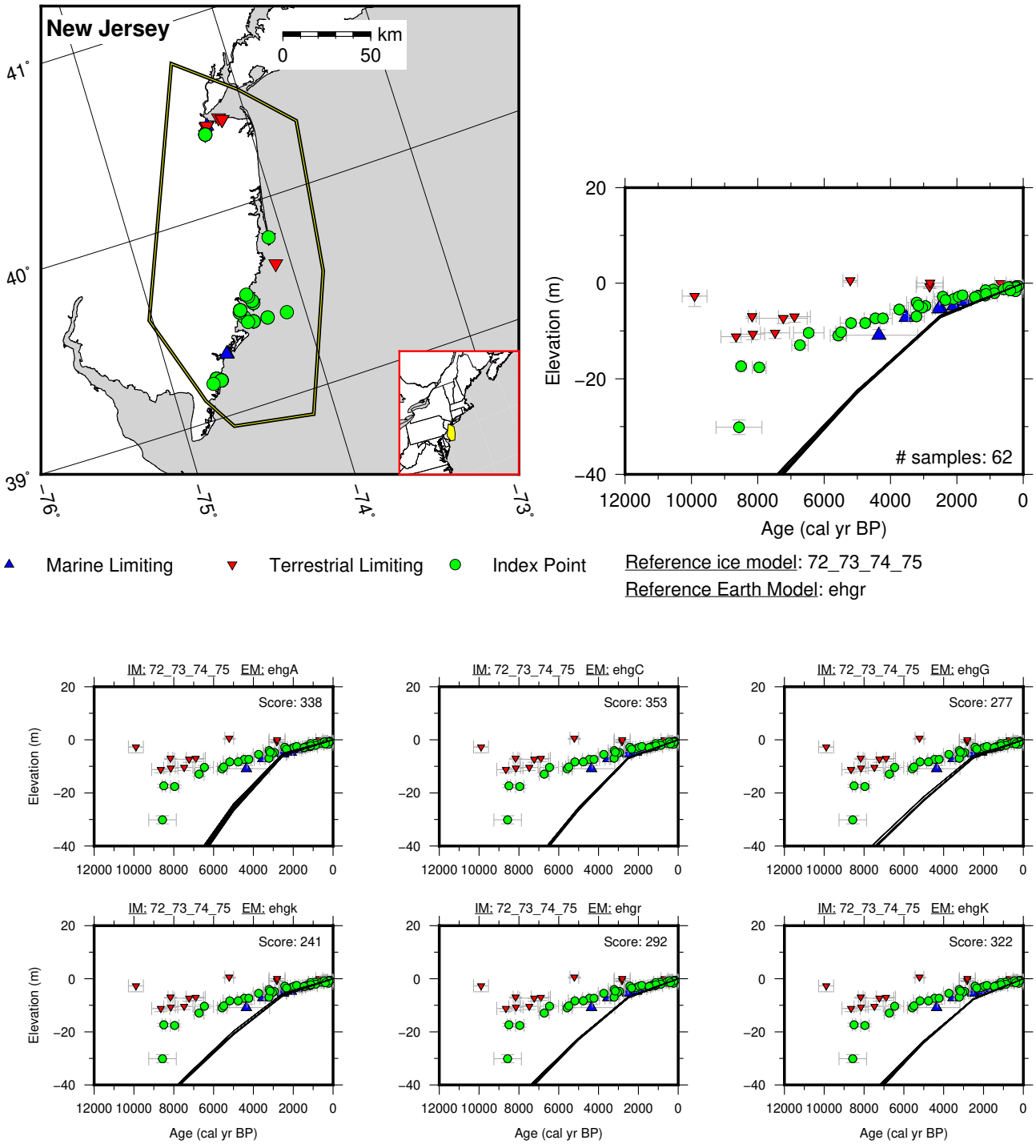


Figure 142: Paleo-sea level and comparison of six models for subregion Northeastern United States, location New Jersey.

11.9 St Laurence Lowlands

References for the data used in each location.

Rimouski: Blake and Lowdon (1976); Dionne (1990, 1999, 2001a, 2005); Dionne and Coll (1995); Dyck and Fyles (1963); Harington (2003); Hétu (1994, 1998); Hétu and Bail (1996); Locat (1977); Vacchi et al. (2018)

Forestville: Dietrich et al. (2017); Dionne (1996, 2001b); Dionne and Occhietti (1996); Dionne et al. (2004); Dubois et al. (1988); Martindale et al. (2020)

Quebec City: Bhiry et al. (2000); Brodeur and Allard (1985); Dionne (1988, 1997, 1998); Filion (1987); Govare and Gangloff (1989); McNeely (2006); McNeely and Brennan (2005); Occhietti et al. (2001); Parent and Occhietti (1988); Samson et al. (1977)

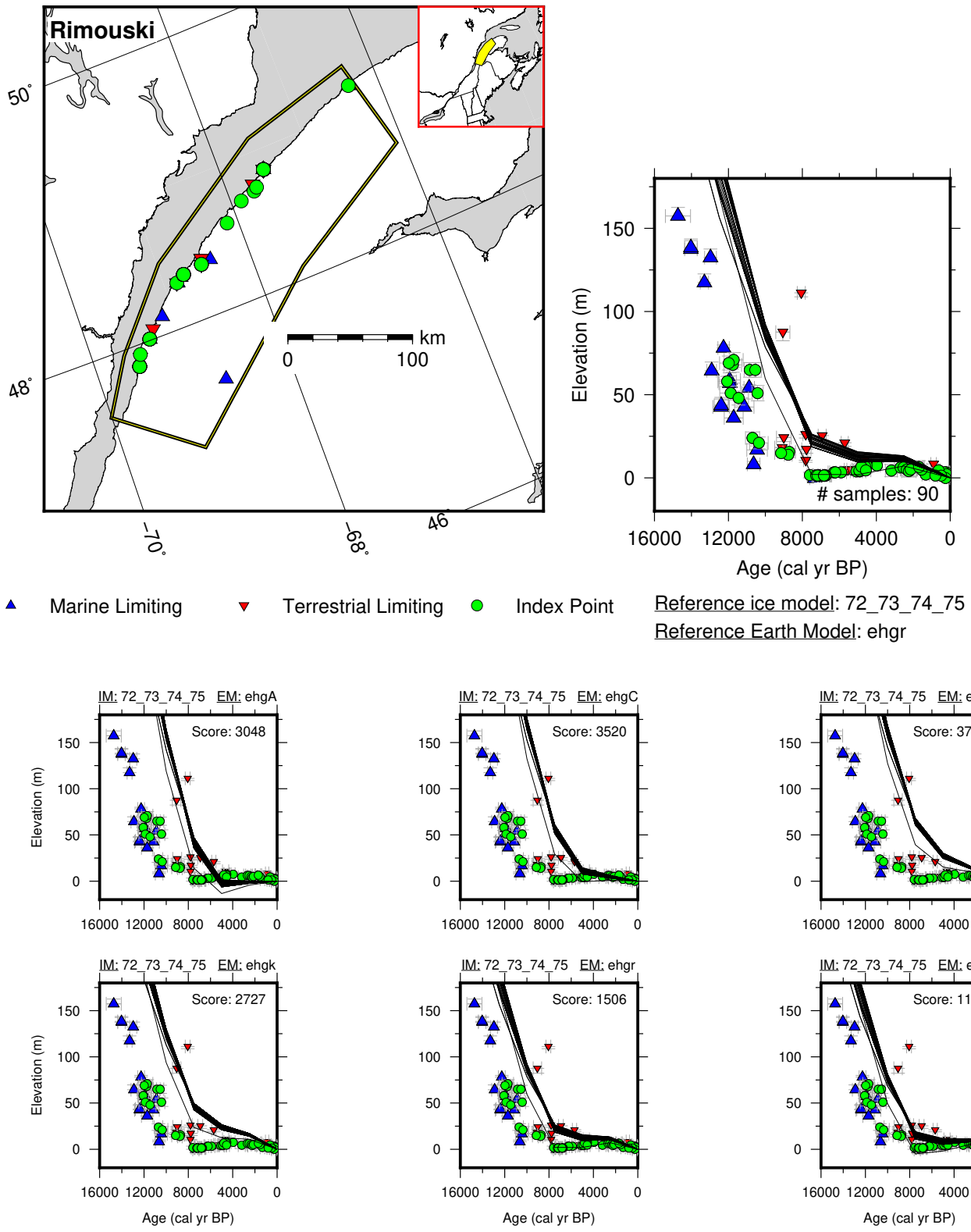


Figure 143: Paleo-sea level and comparison of six models for subregion St Laurence Lowlands, location Rimouski.

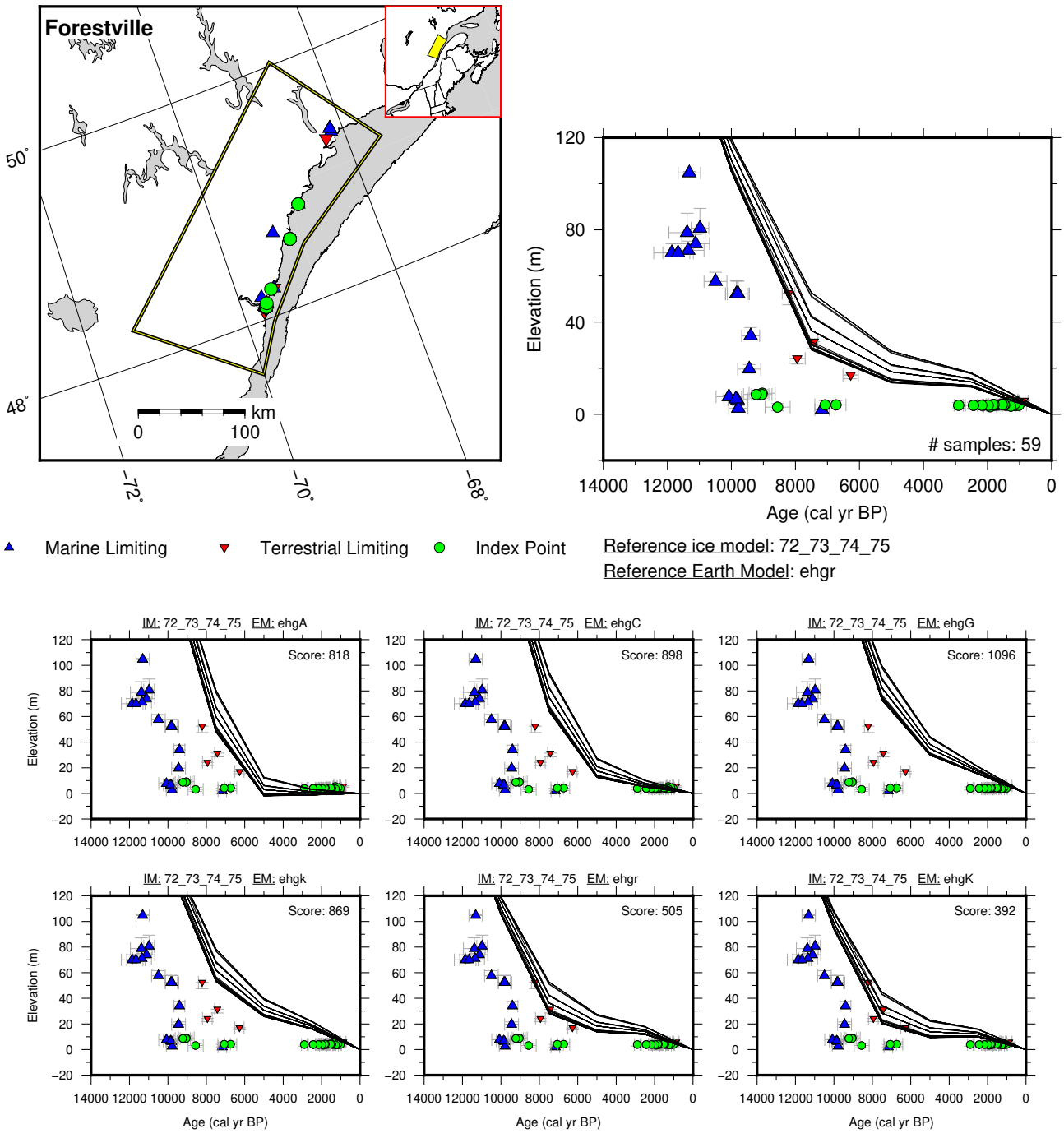


Figure 144: Paleo-sea level and comparison of six models for subregion St Laurence Lowlands, location Forestville.

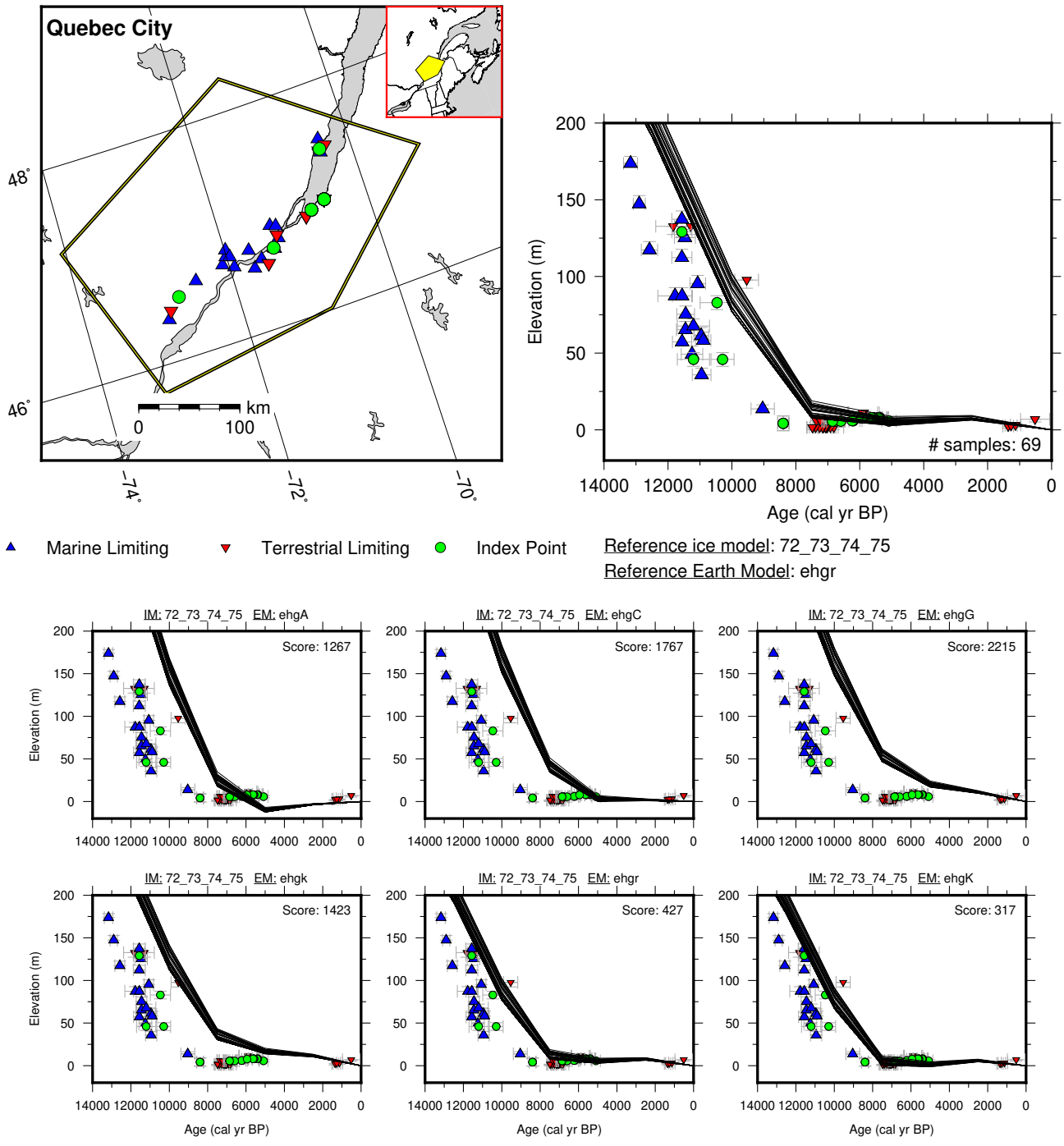


Figure 145: Paleo-sea level and comparison of six models for subregion St Laurence Lowlands, location Quebec City.

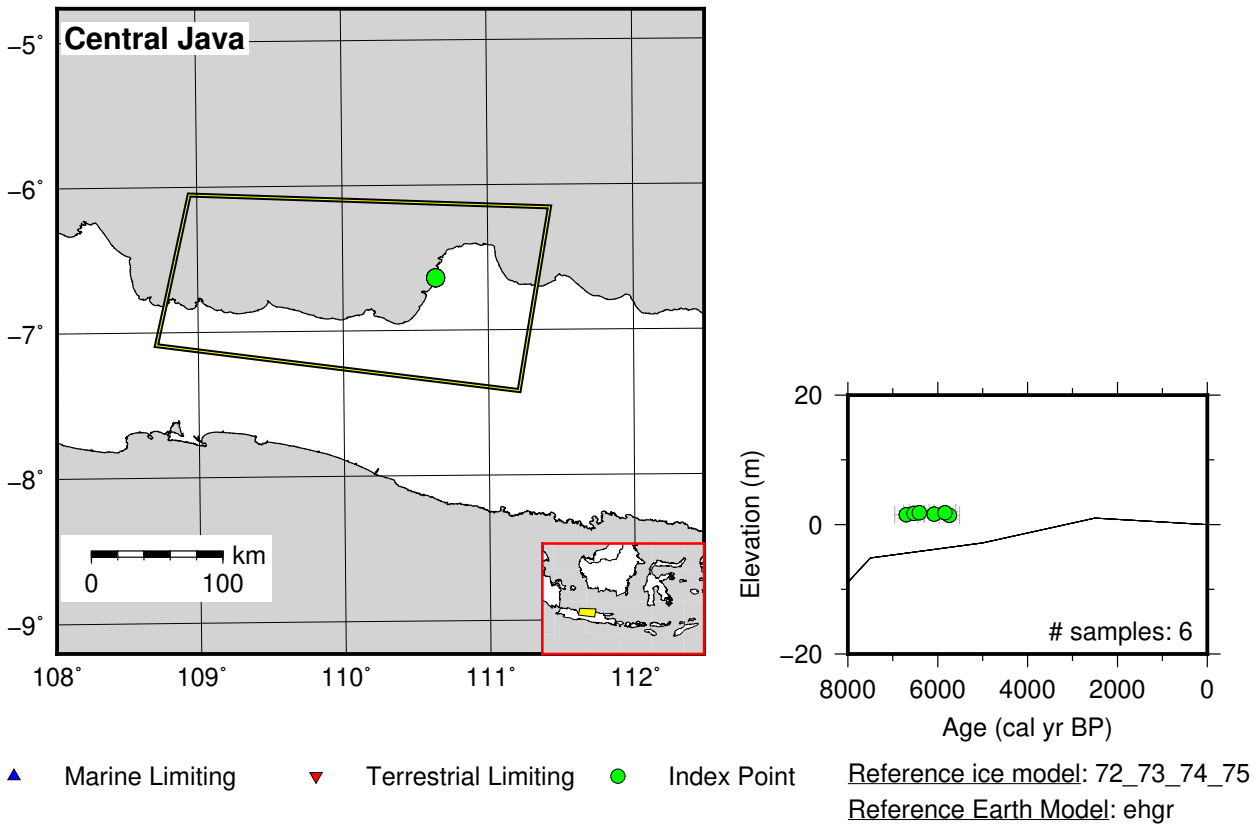
12 Southeast Asia

12.1 Java Sea

References for the data used in each location.

Central Java: Azmy et al. (2010)

South Sulawesi: de Klerk (1982); Mann et al. (2016); Tjia et al. (1972)



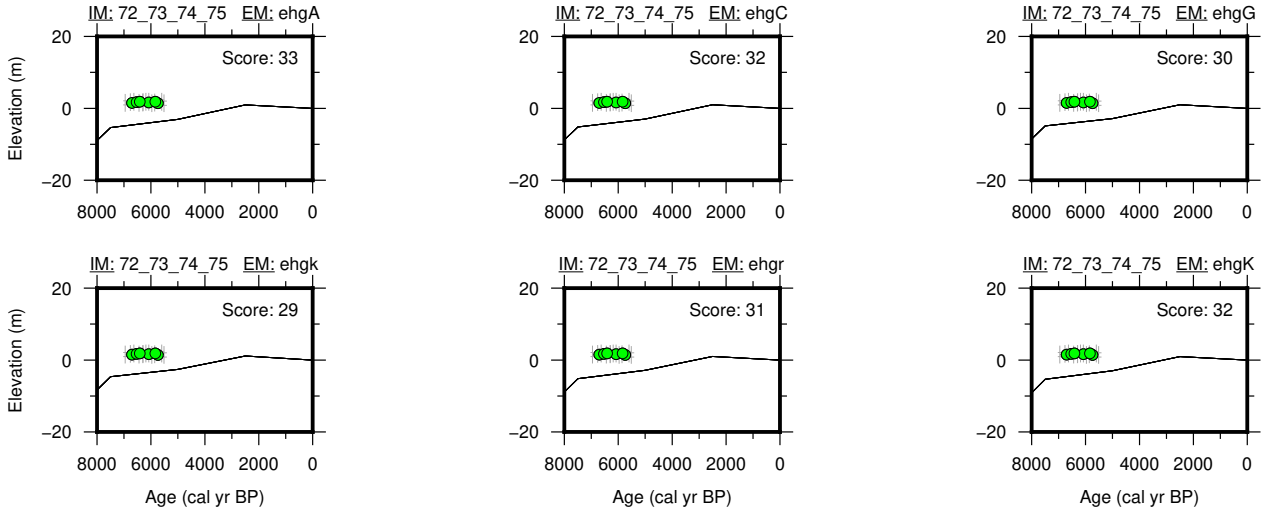


Figure 146: Paleo-sea level and comparison of six models for subregion Java Sea, location Central Java.

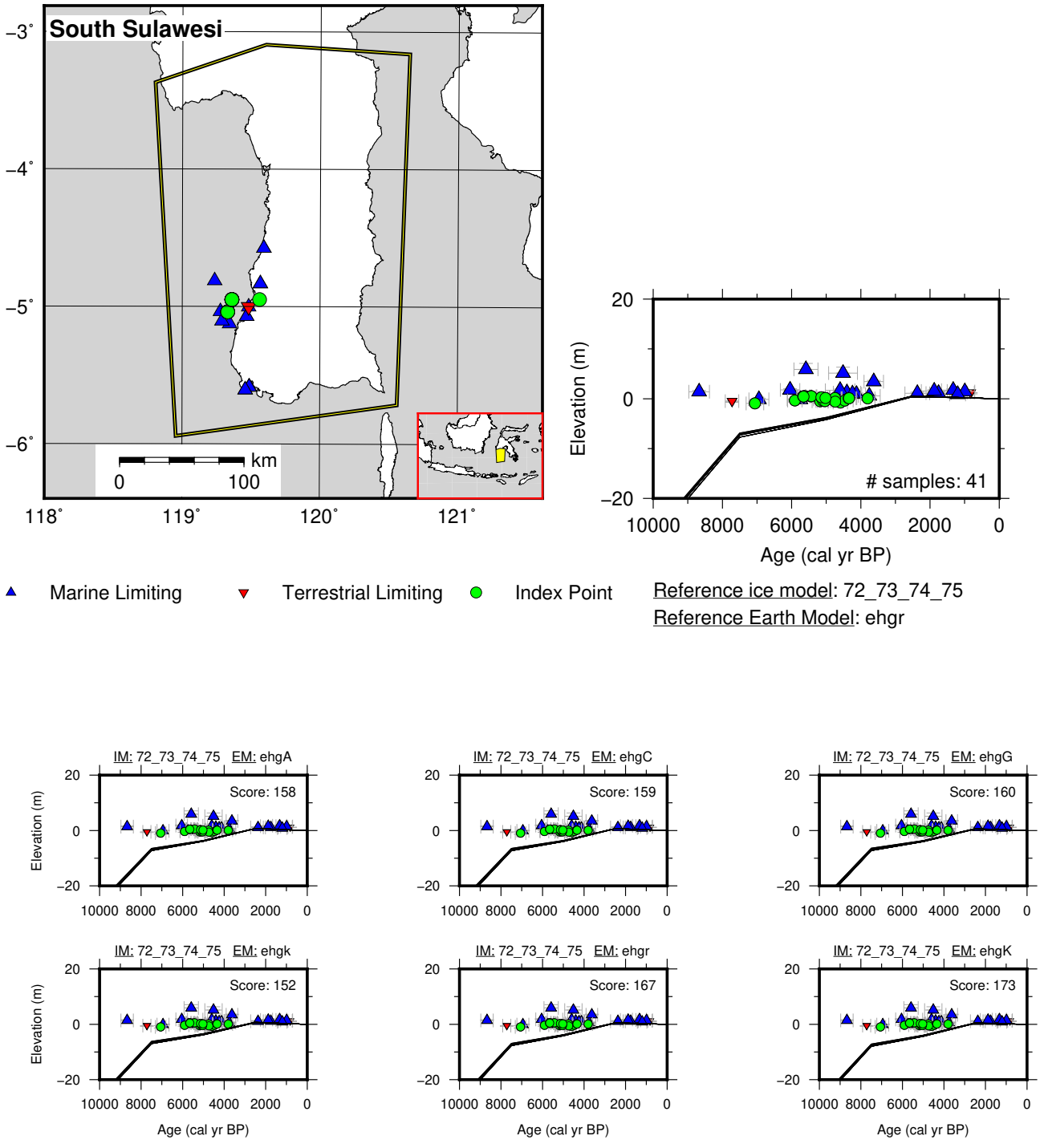


Figure 147: Paleo-sea level and comparison of six models for subregion Java Sea, location South Sulawesi.

12.2 Papua New Guinea

References for the data used in each location.

Huon Peninsula: Chappell and Polach (1991); Cutler et al. (2003, 2004); Edwards et al. (1993); Hibbert et al. (2016)

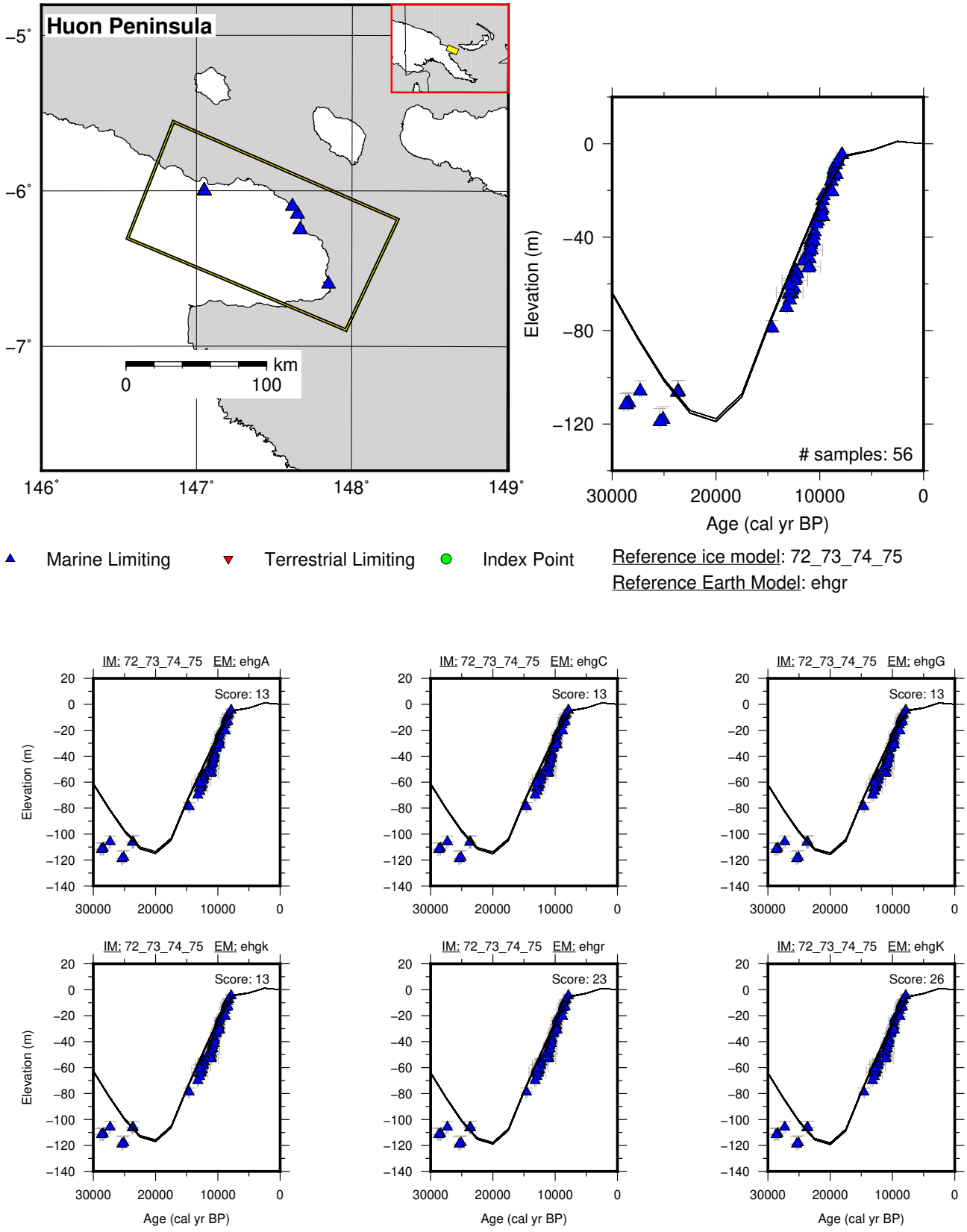


Figure 148: Paleo-sea level and comparison of six models for subregion Papua New Guinea, location Huon Peninsula.

12.3 Sundaland

References for the data used in each location.

Chao Phraya: Horton et al. (2005); Sinsakul (1992); Somboon (1988); Somboon and Thiramongkol (1992)

Mekong Delta: Hanebuth et al. (2012); Stattegger et al. (2013); Tamura et al. (2007, 2009)

Strait Of Malacca: Bird et al. (2007, 2010); Geyh et al. (1979); Hassan (2001); Hesp et al. (1998); Horton et al. (2005); Tjia and Fujii (1992)

Sunda Shelf: Hanebuth et al. (2000, 2003, 2009)

Vietnam Shelf: Hanebuth et al. (2000)

Phuket: Scheffers et al. (2012); Scoffin and Le Tissier (1998)

Thale Noi: Horton et al. (2005)

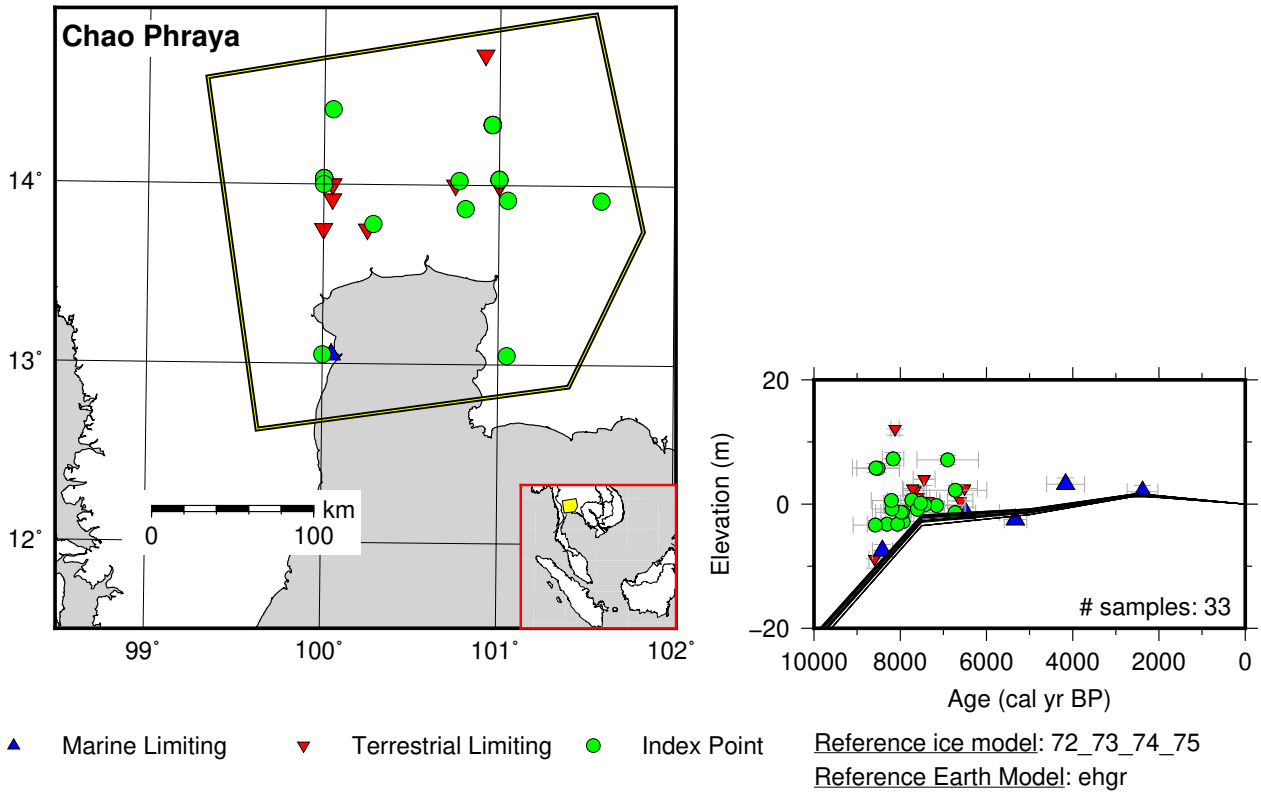
West Malay Peninsula: Tjia and Fujii (1992); Tjia et al. (1972)

East Malay Peninsula: Parham et al. (2014); Tjia and Fujii (1992)

Southeast Malay Peninsula: Hassan (2001); Horton et al. (2005); Tjia and Fujii (1992); Tjia et al. (1983)

Belitung Island: Meltzner et al. (2017)

Ca Na: Stattegger et al. (2013)



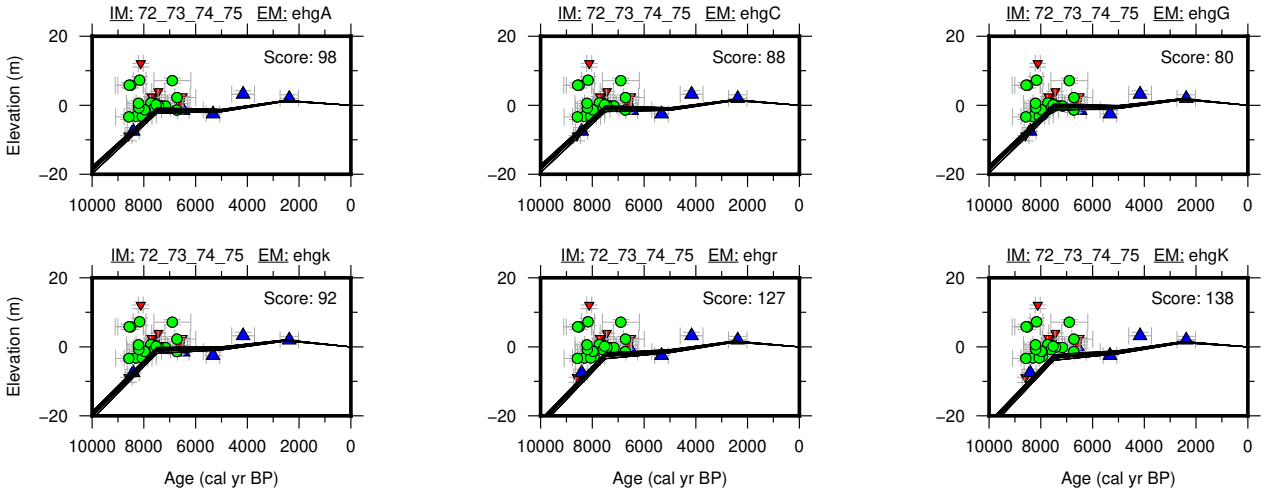


Figure 149: Paleo-sea level and comparison of six models for subregion Sundaland, location Chao Phraya.

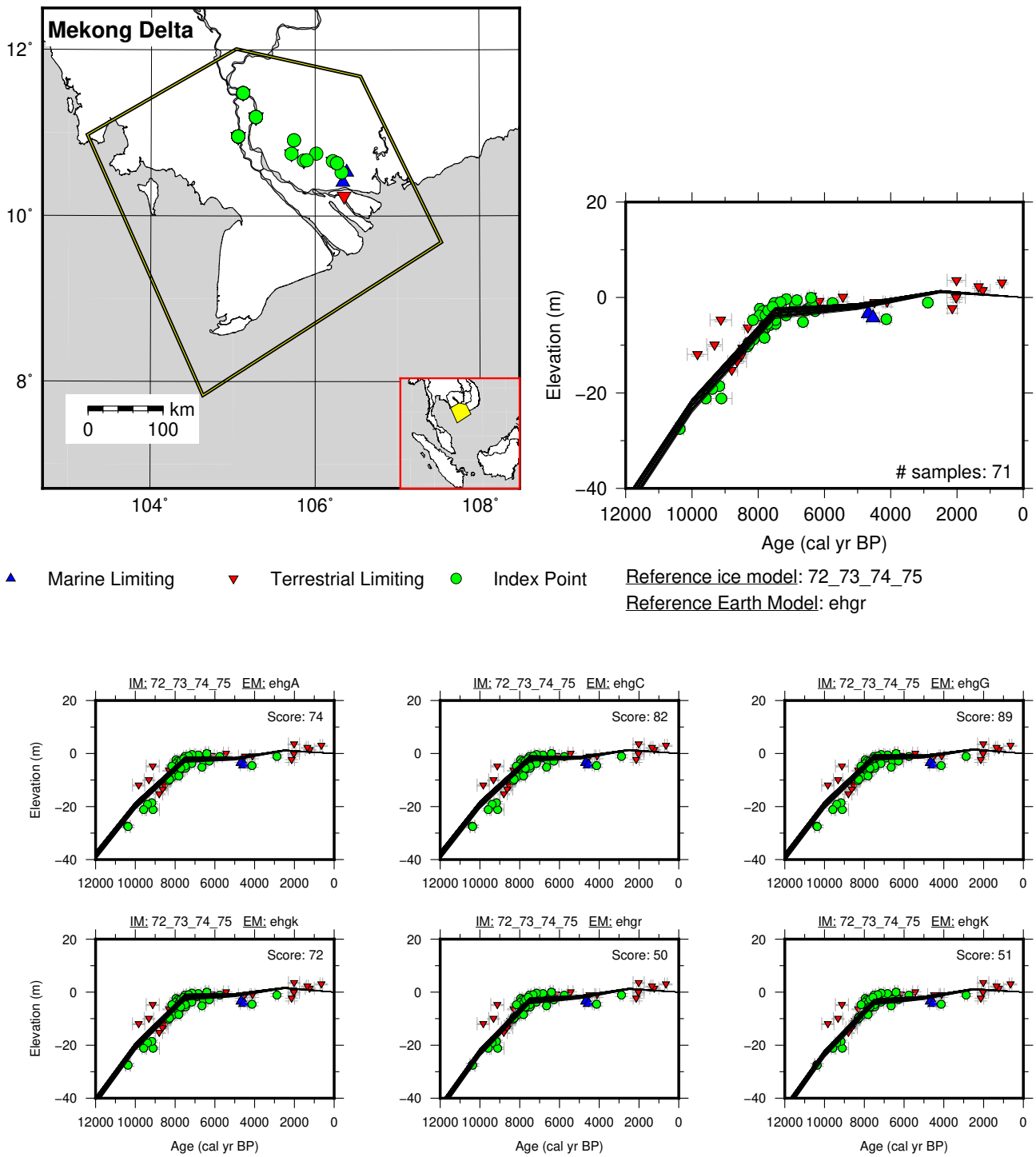
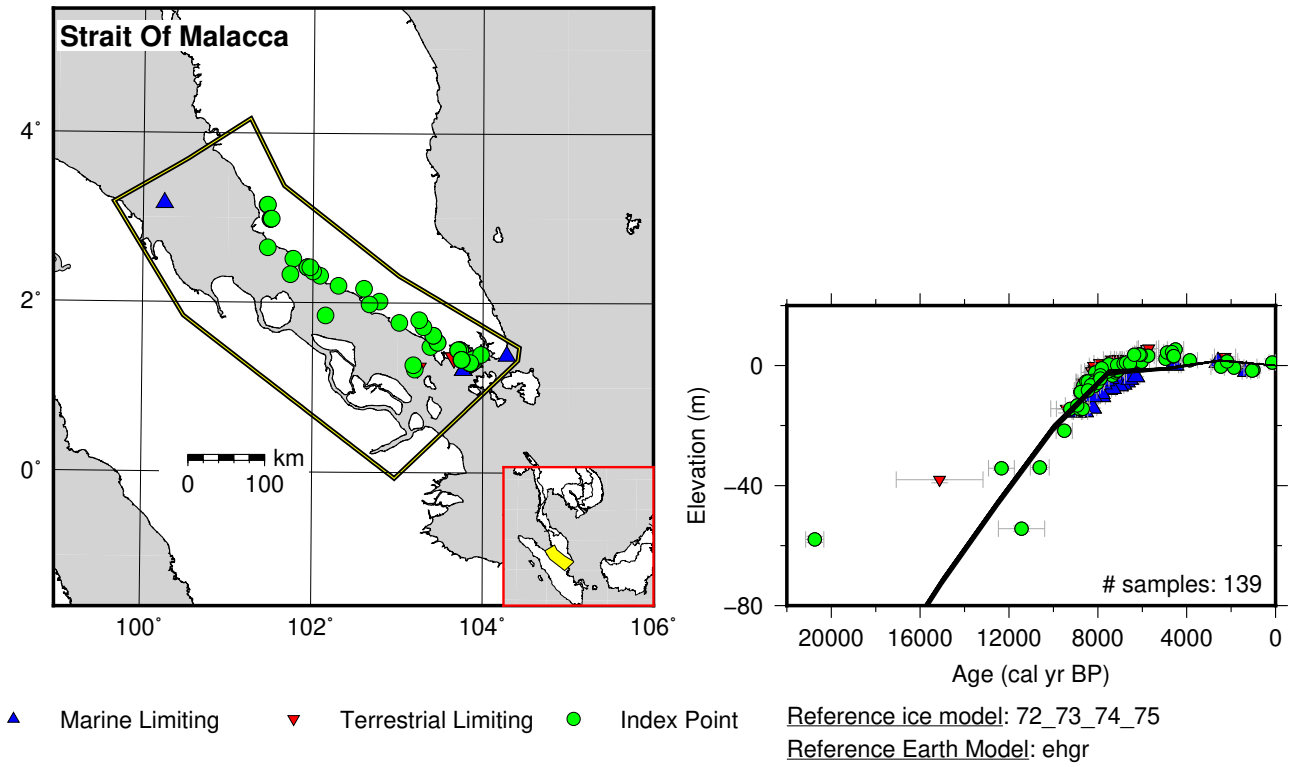


Figure 150: Paleo-sea level and comparison of six models for subregion Sundaland, location Mekong Delta.



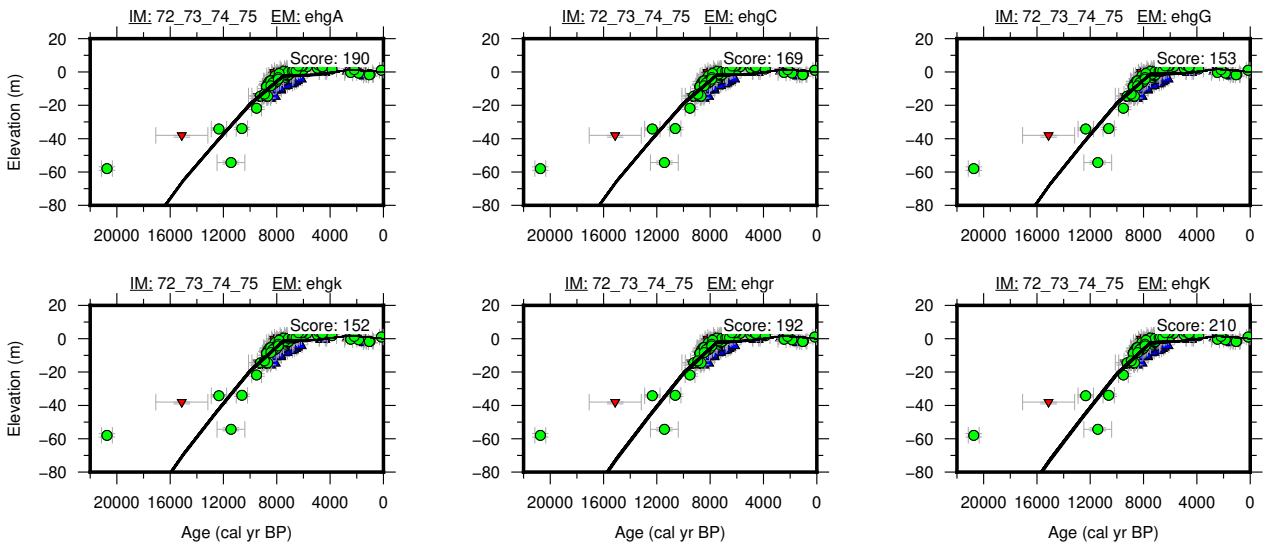


Figure 151: Paleo-sea level and comparison of six models for subregion Sundaland, location Strait Of Malacca.

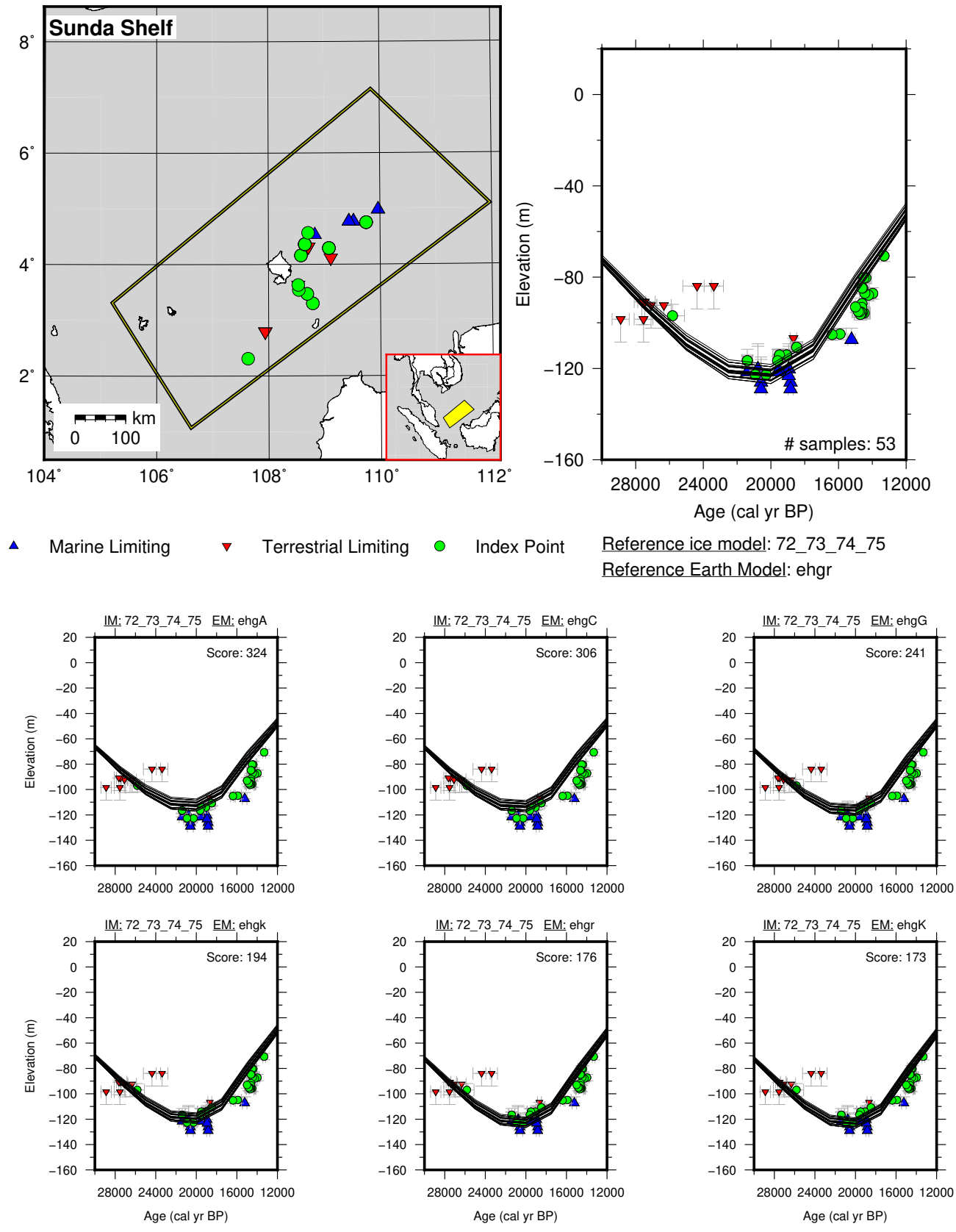


Figure 152: Paleo-sea level and comparison of six models for subregion Sundaland, location Sunda Shelf.

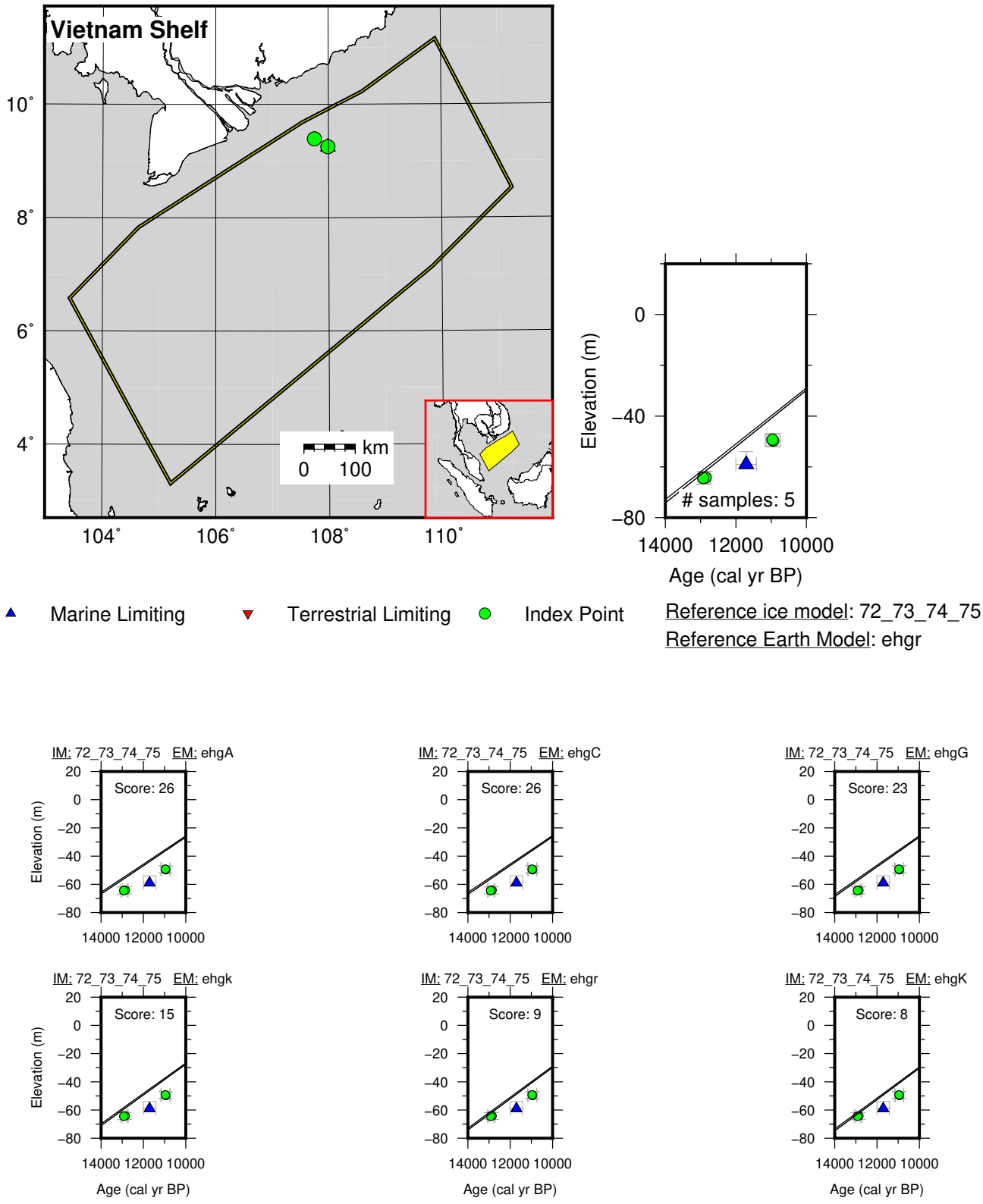
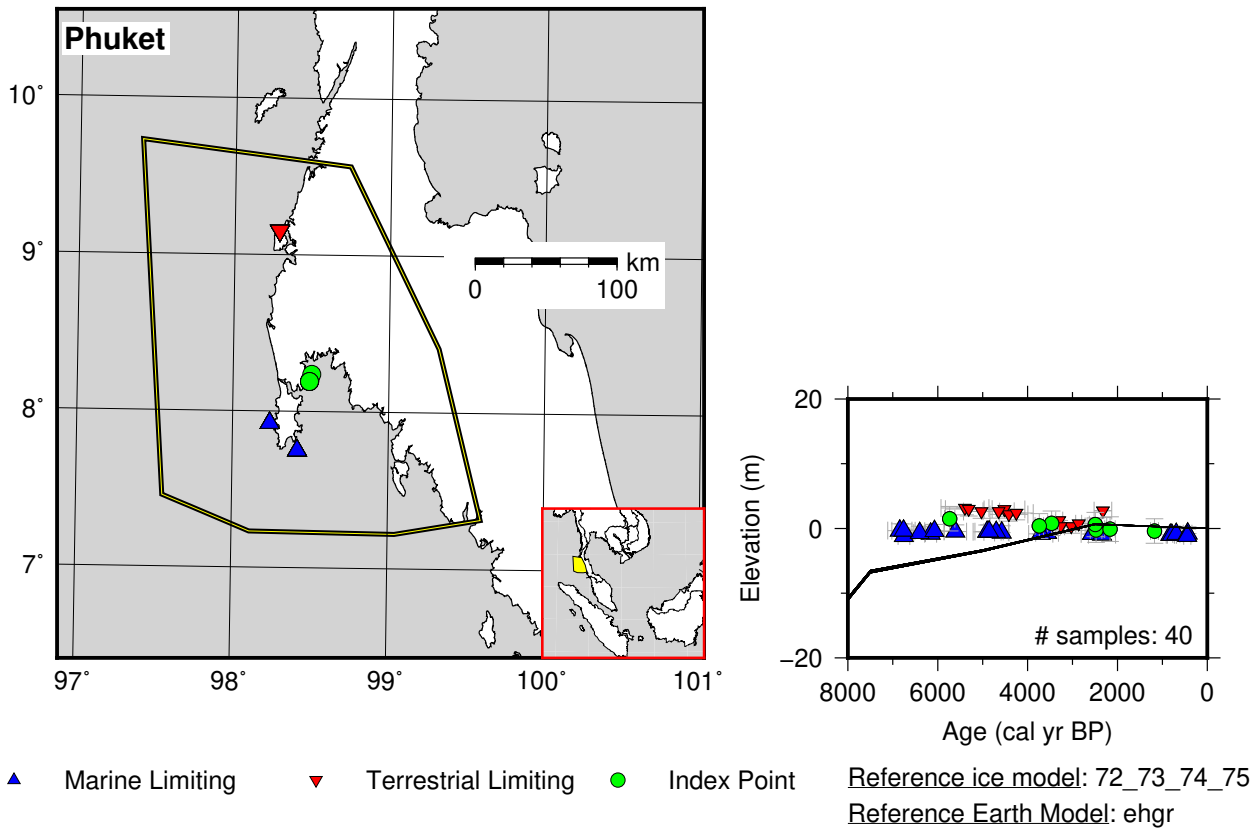


Figure 153: Paleo-sea level and comparison of six models for subregion Sundaland, location Vietnam Shelf.



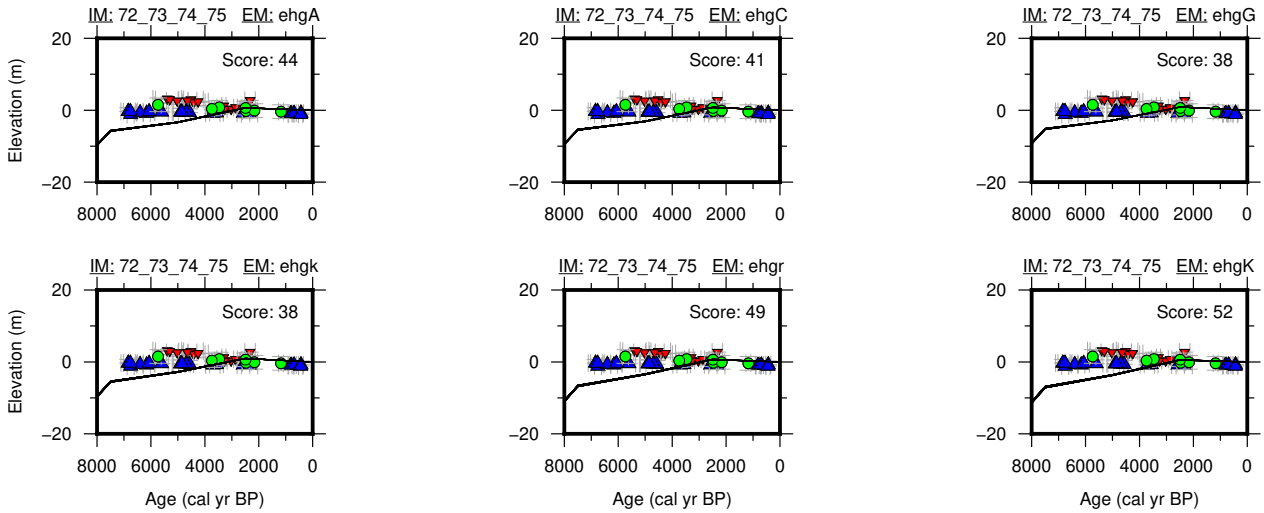
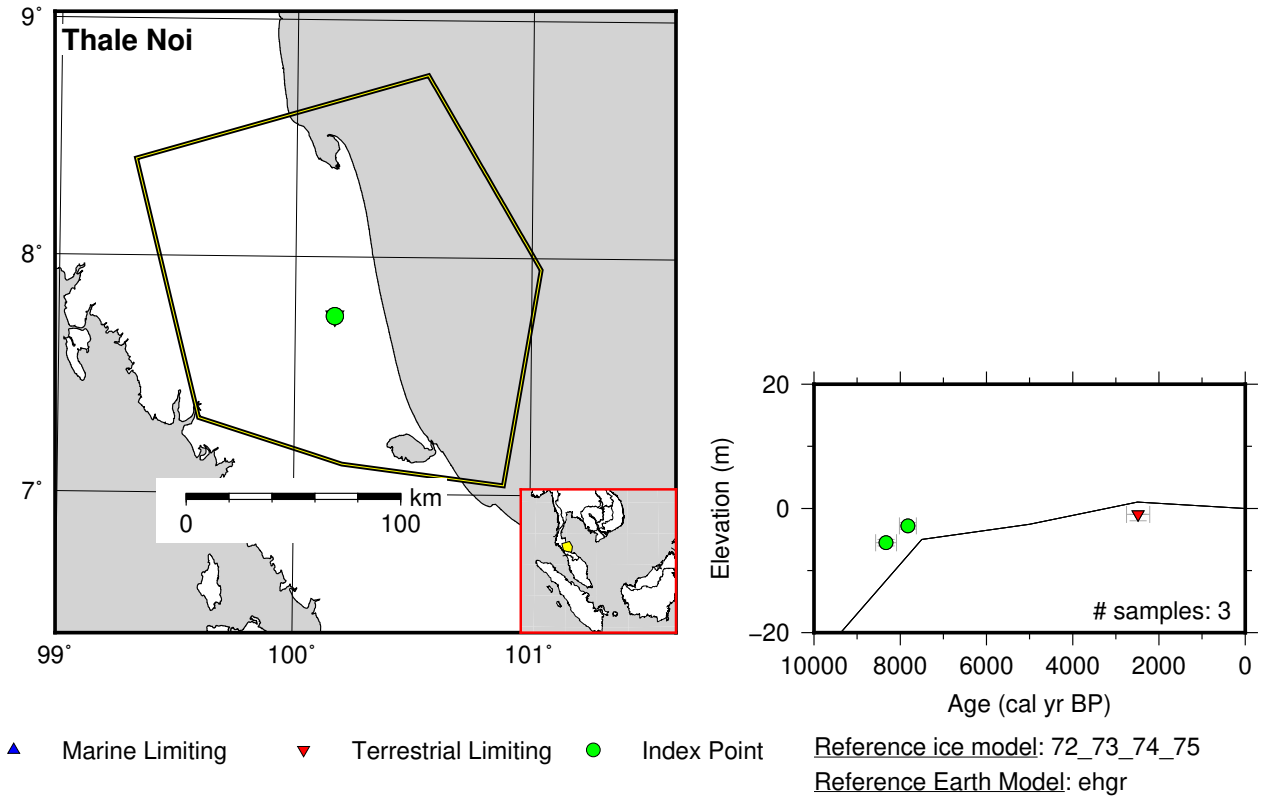


Figure 154: Paleo-sea level and comparison of six models for subregion Sundaland, location Phuket.



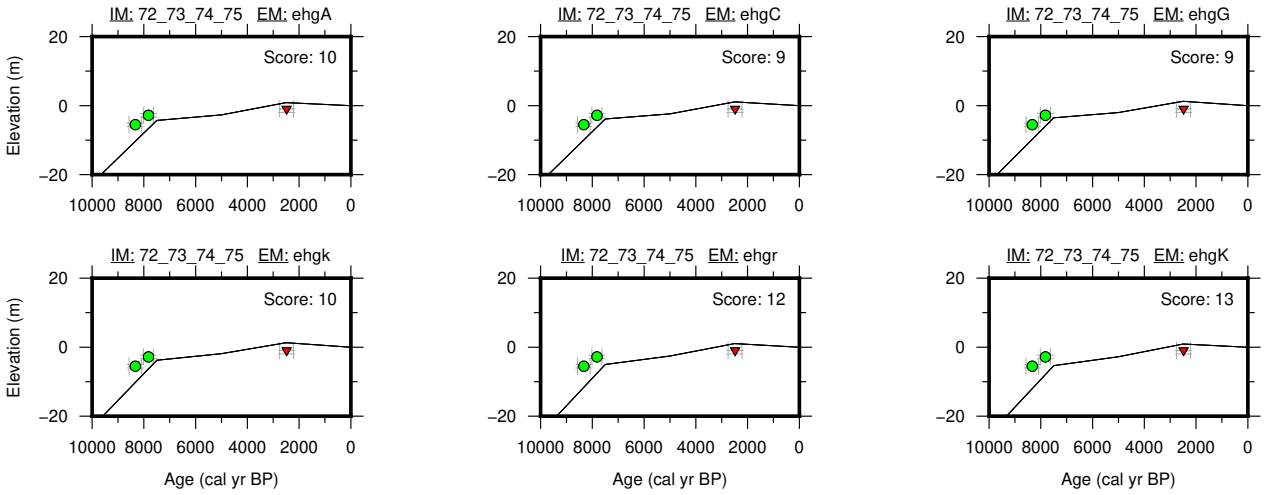


Figure 155: Paleo-sea level and comparison of six models for subregion Sundaland, location Thale Noi.

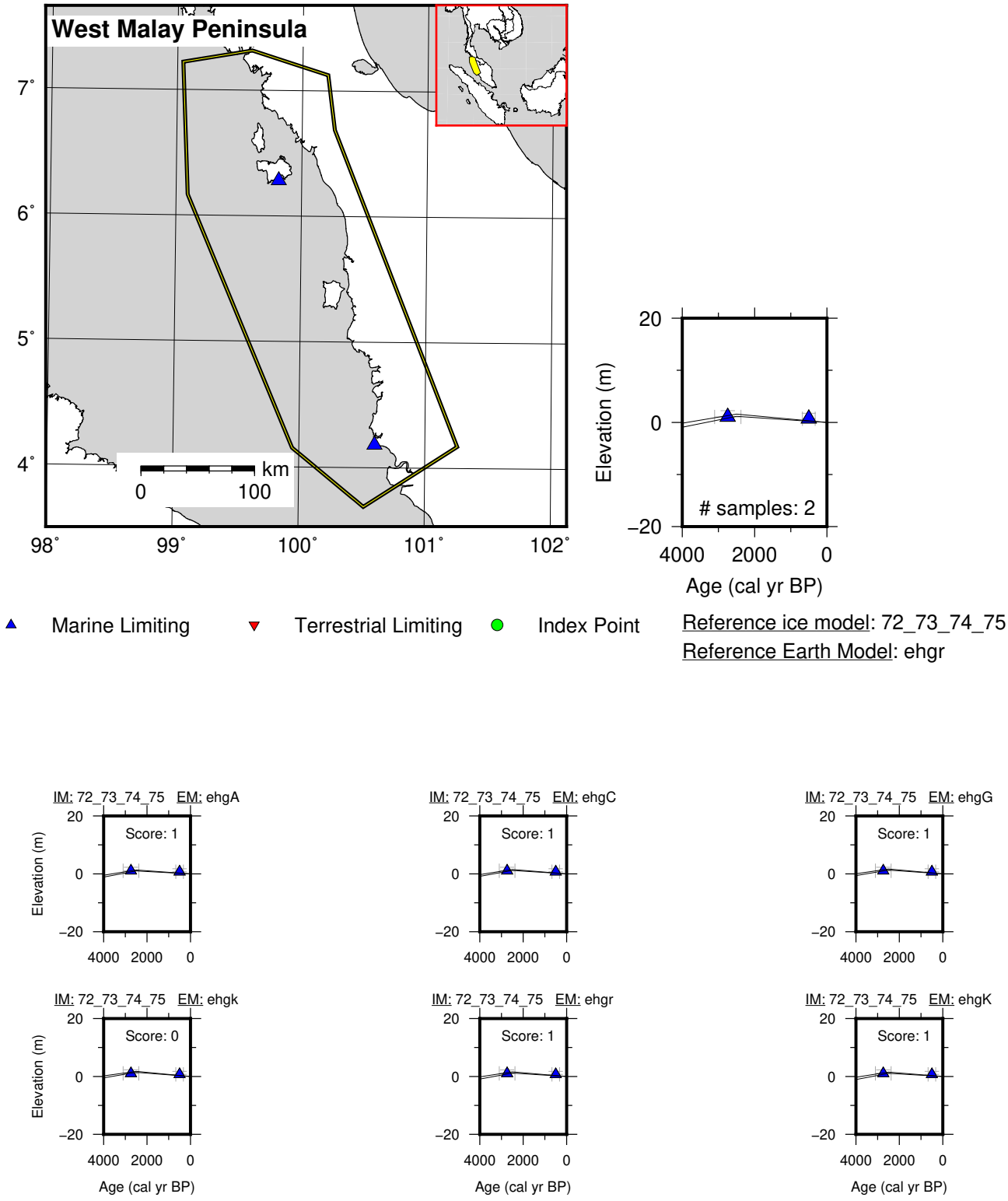
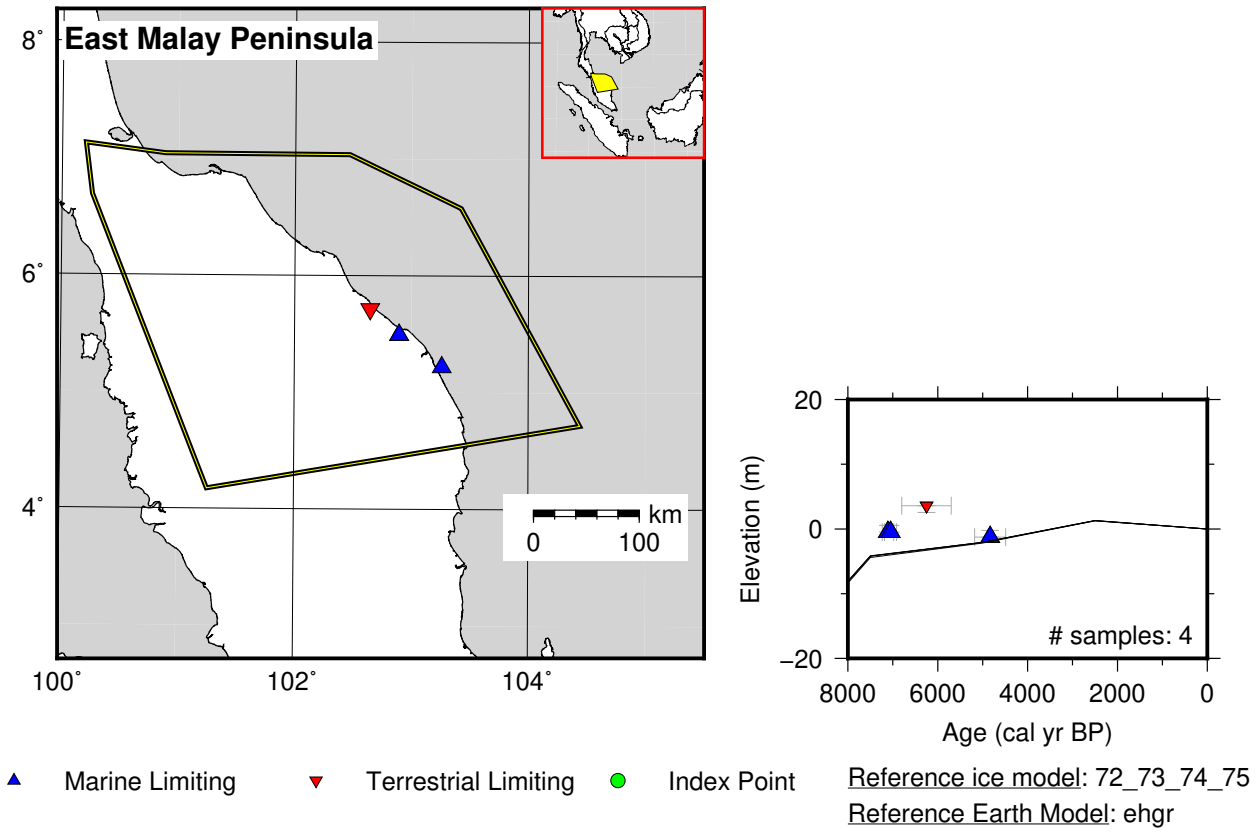


Figure 156: Paleo-sea level and comparison of six models for subregion Sundaland, location West Malay Peninsula.



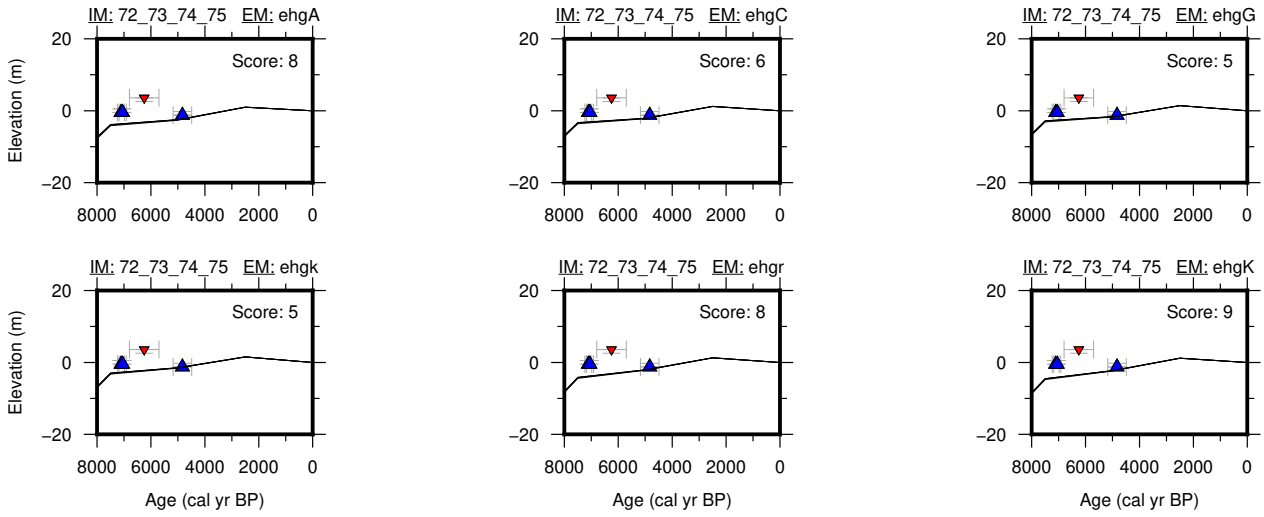
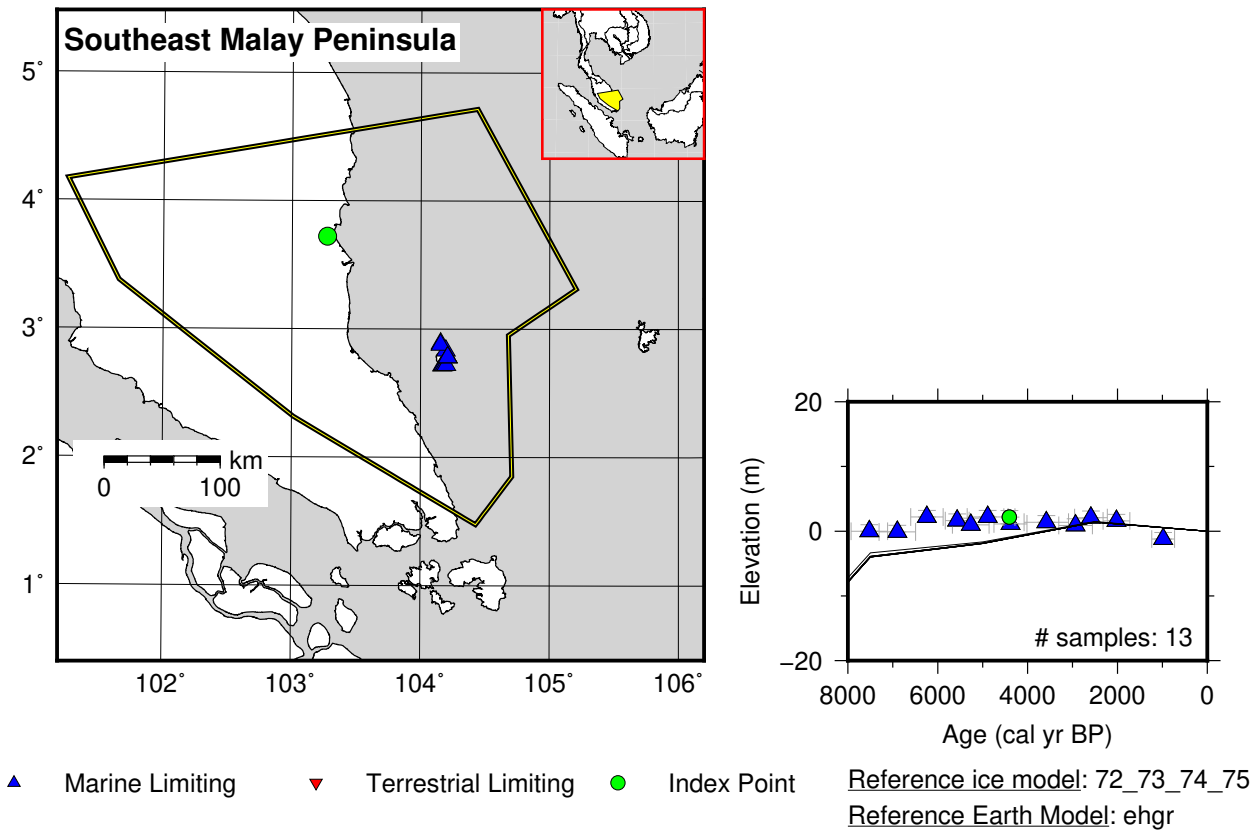


Figure 157: Paleo-sea level and comparison of six models for subregion Sundaland, location East Malay Peninsula.



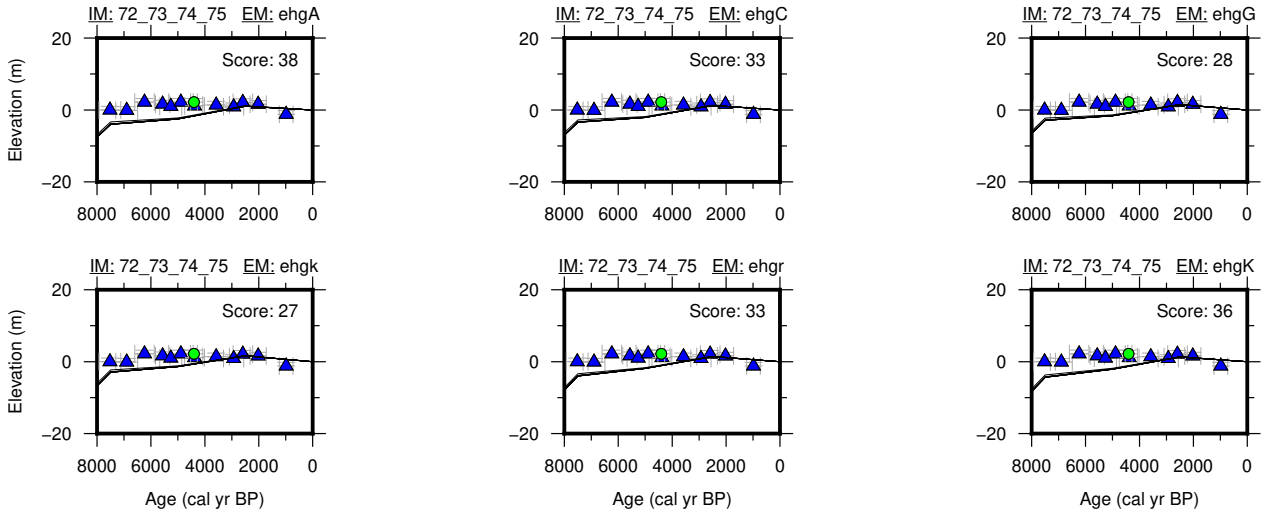
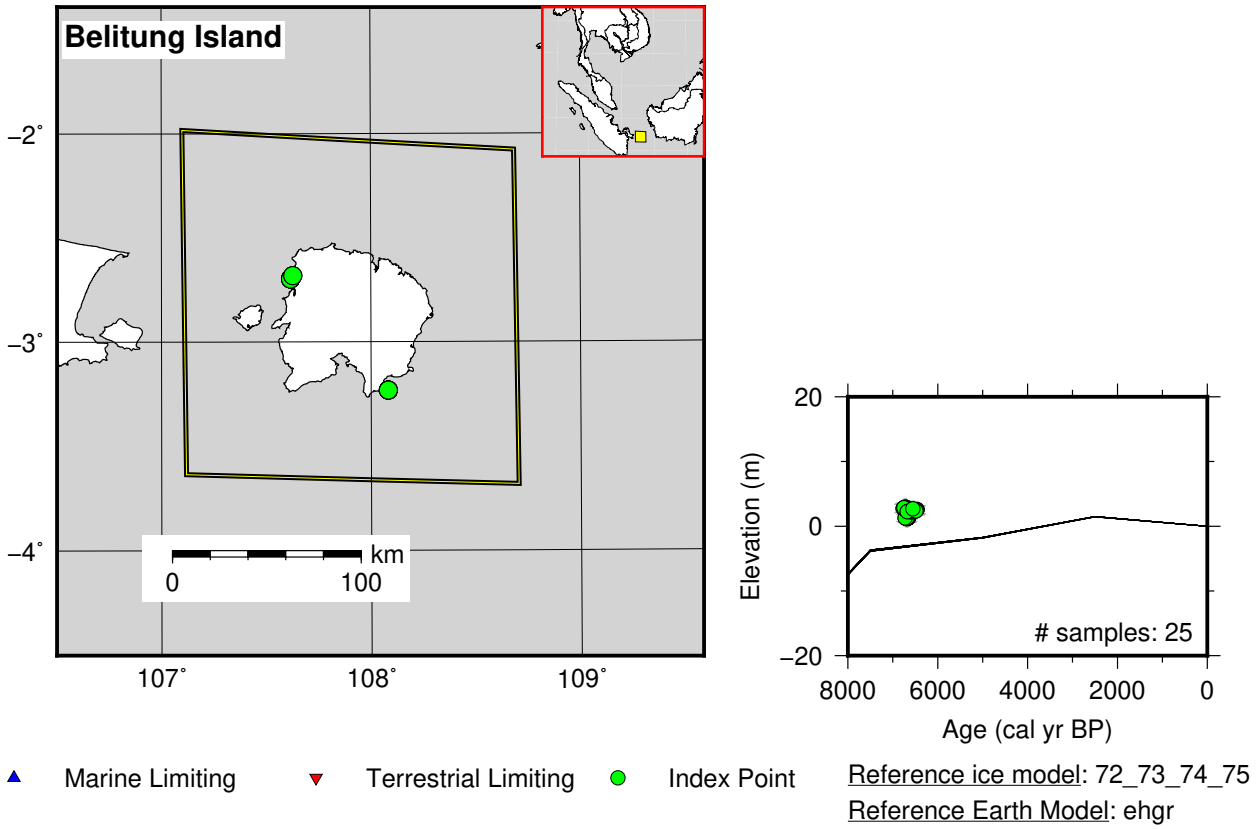


Figure 158: Paleo-sea level and comparison of six models for subregion Sundaland, location Southeast Malay Peninsula.



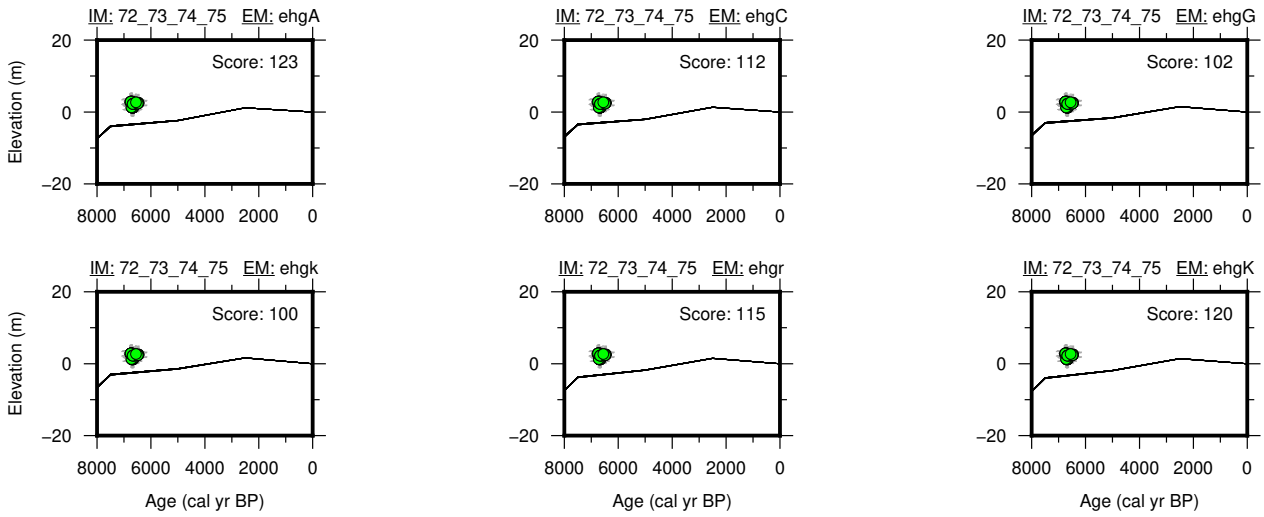
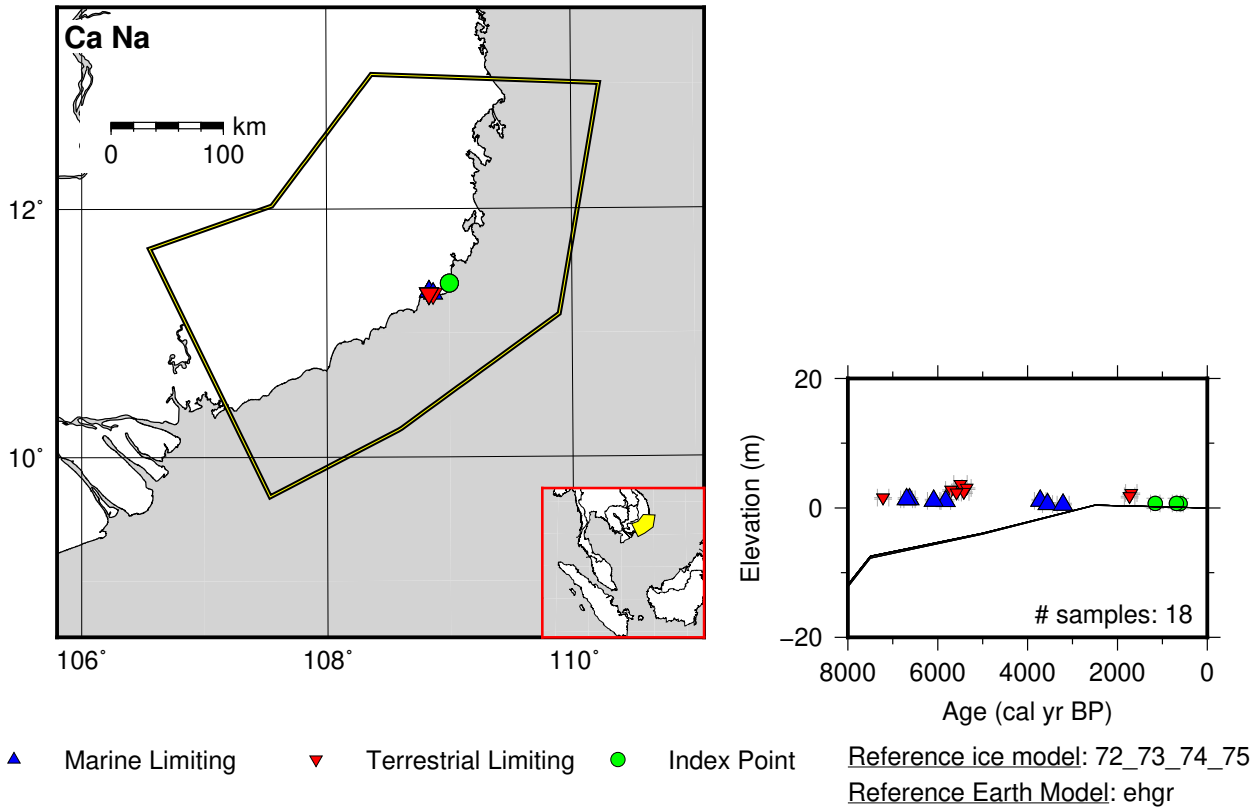


Figure 159: Paleo-sea level and comparison of six models for subregion Sundaland, location Belitung Island.



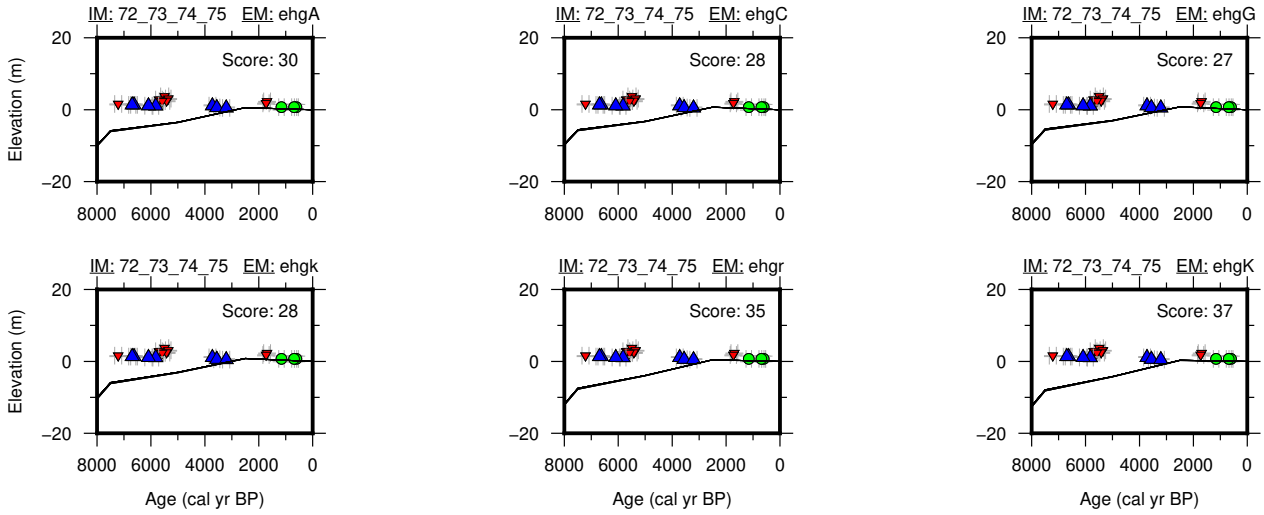


Figure 160: Paleo-sea level and comparison of six models for subregion Sundaland, location Ca Na.

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