Diurnal Warming from Unpumped Argo floats and SEVIRI

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GHRSST XIV, WHOODS HOLE, 2013

DO UNPUMPED (APEX) ARGO FLOATS PROVIDE ACCURATE MEASUREMENTS OF NEAR SURFACE TEMPERATURES AND DIURNAL WARMING?

DIURNAL WARMING FROM APEX ARGO FLOATS

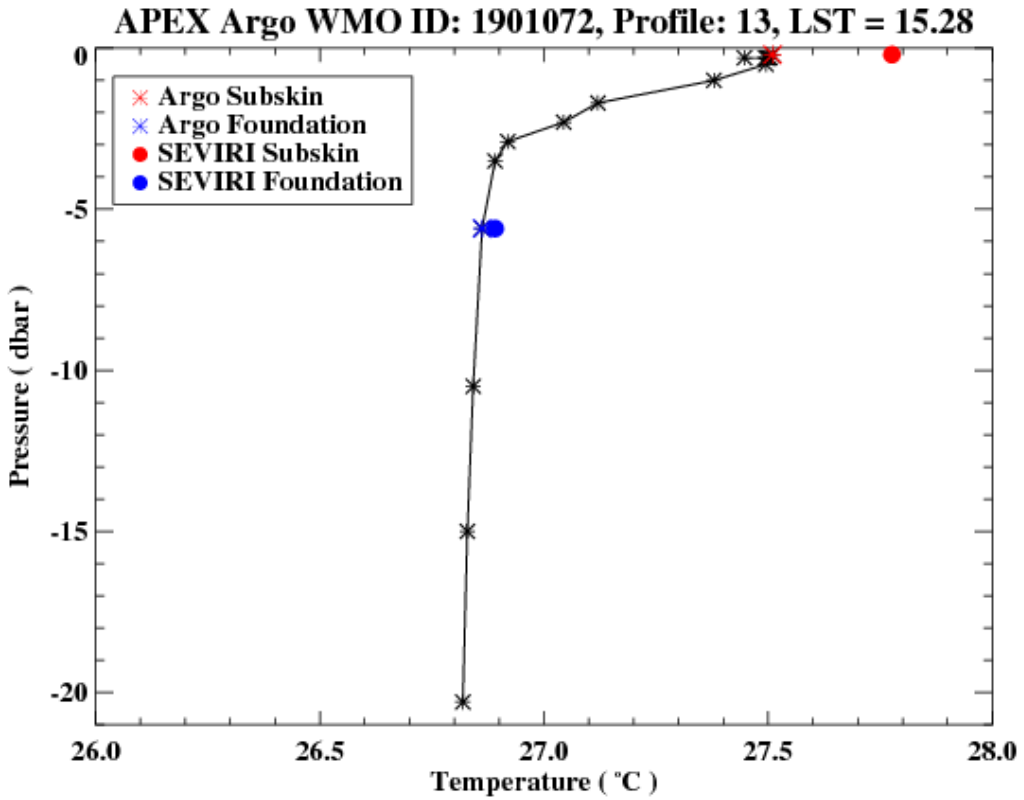
Looked at all the APEX Argo floats that surfaced within the SEVIRI domain between 2009- March 2012

Classified the unpumped near-surface temperature profiles into two groups: isothermal profiles and those with discernible diurnal thermoclines in the top 20 m

Visually extracted the subskin SST and the foundation temperature from the shape of the profile. The surface breaking point was determined visually and no consideration to pressure differential was given

Kept the top-most pumped temperature record (~5 m-depth) for comparisons with standard Argo floats

Computed diurnal warming as subskin SST minus foundation SST



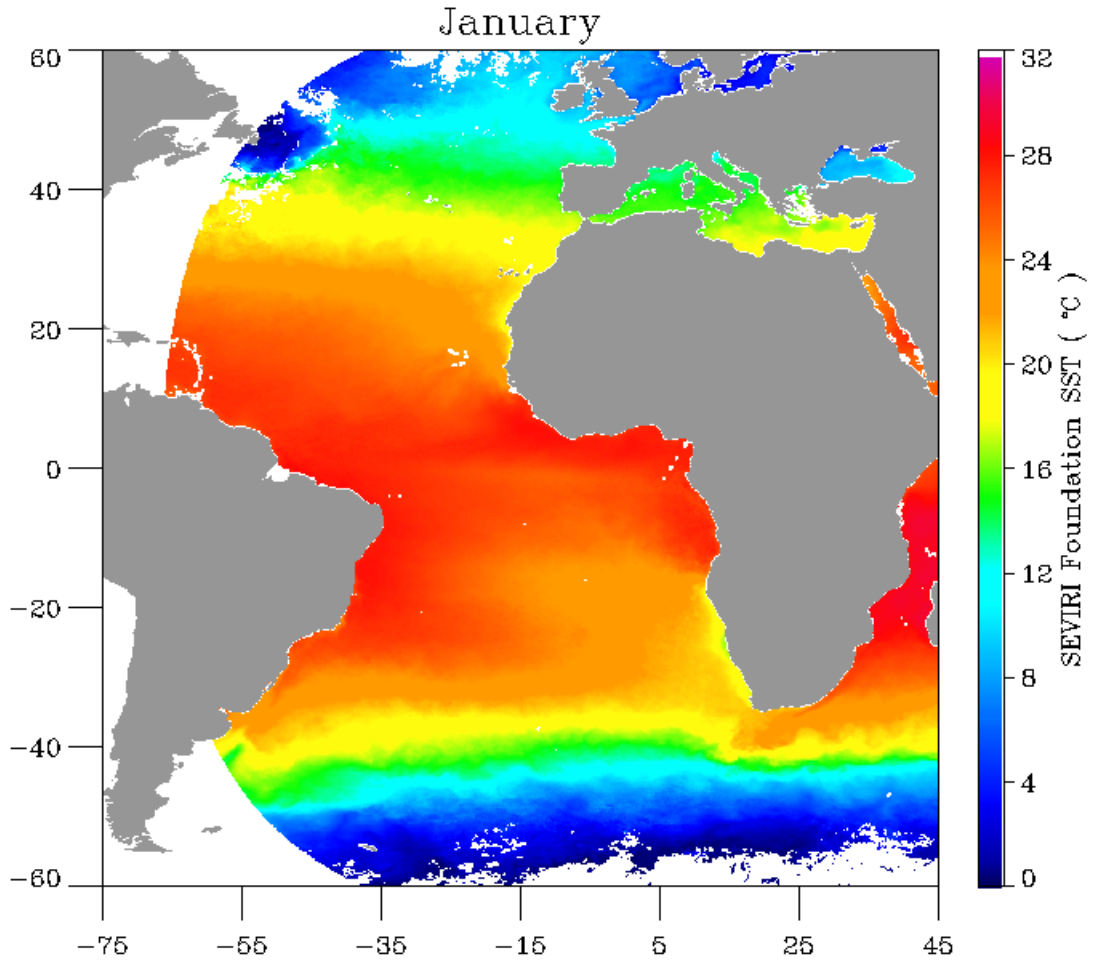
DIURNAL WARMING FROM SEVIRI

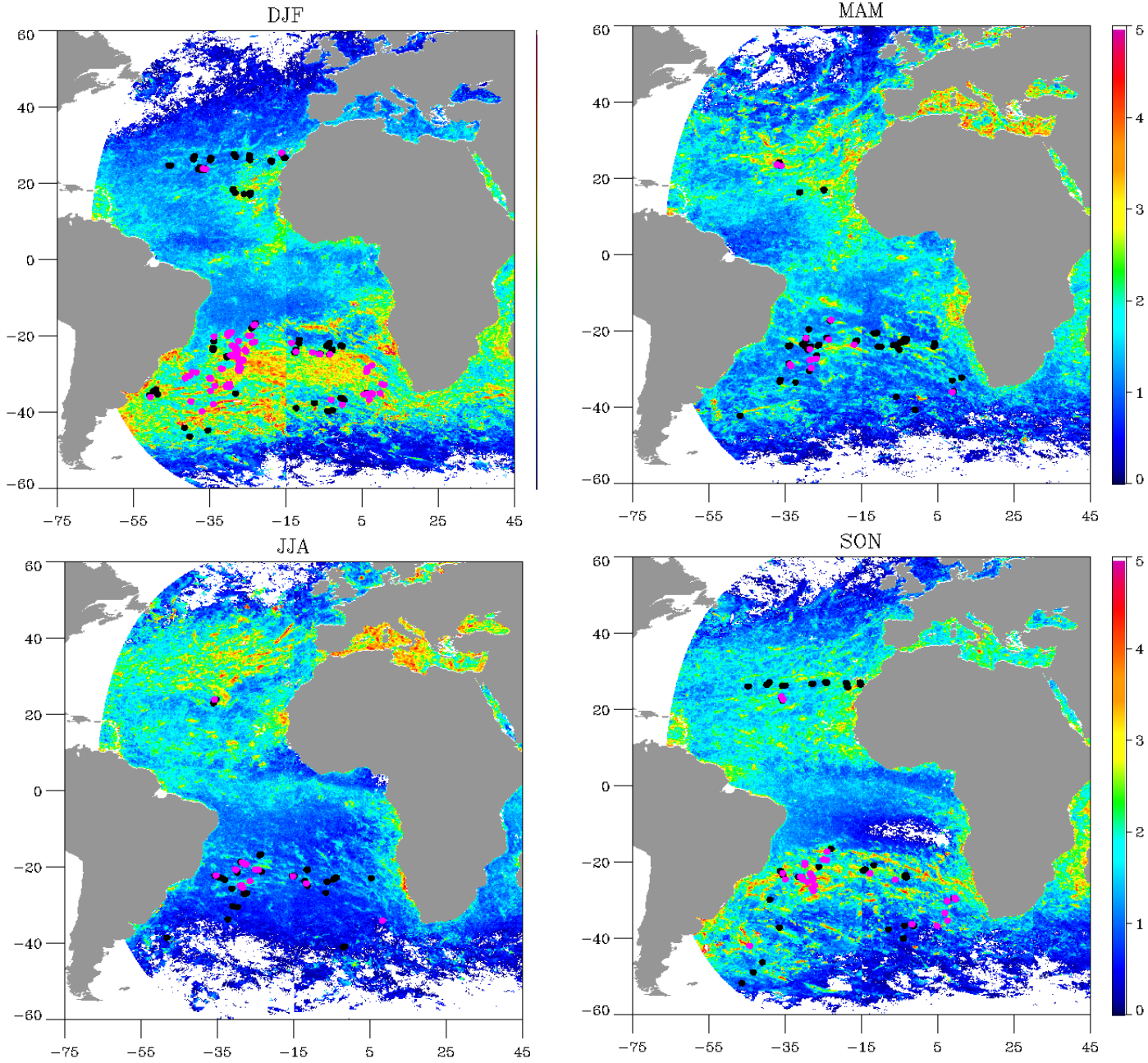
Derived a foundation SST from SEVIRI as the mean-value SST composite from the previous night 3-hourly images from 2200 to 0700 LST.

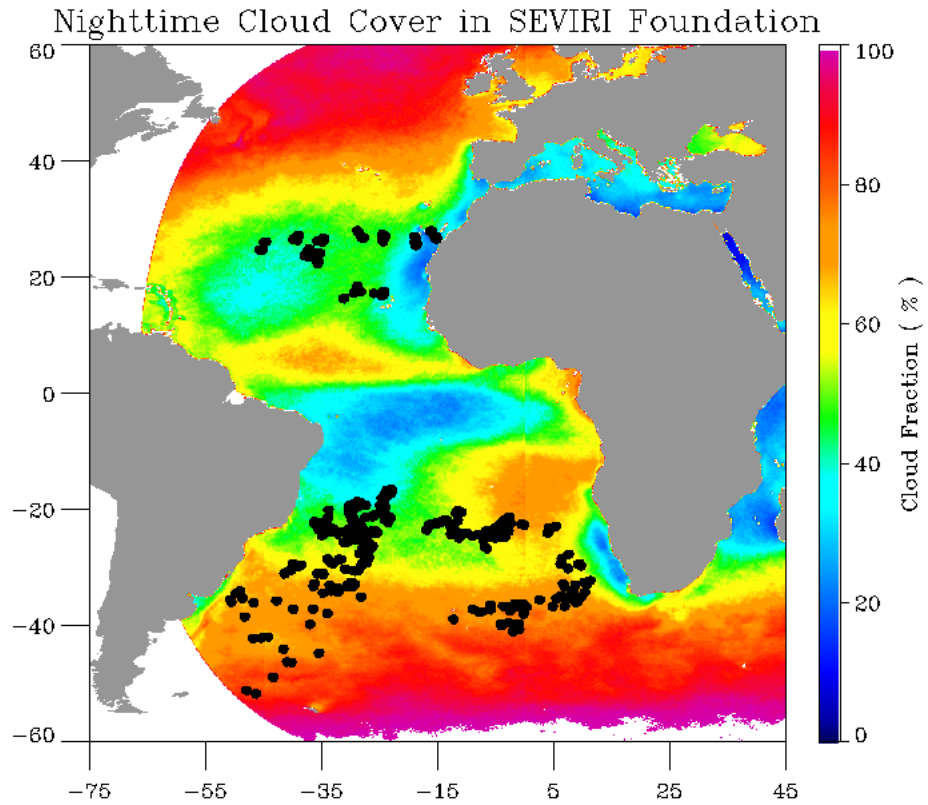
Subskin is extracted from the 3h image closest in time to the Argo surfacing time.

Considered 5x5 imagettes centered on the position of the Argo. No restrictions on minimum % of clear sky pixels.

DW = Subskin SST – Foundation

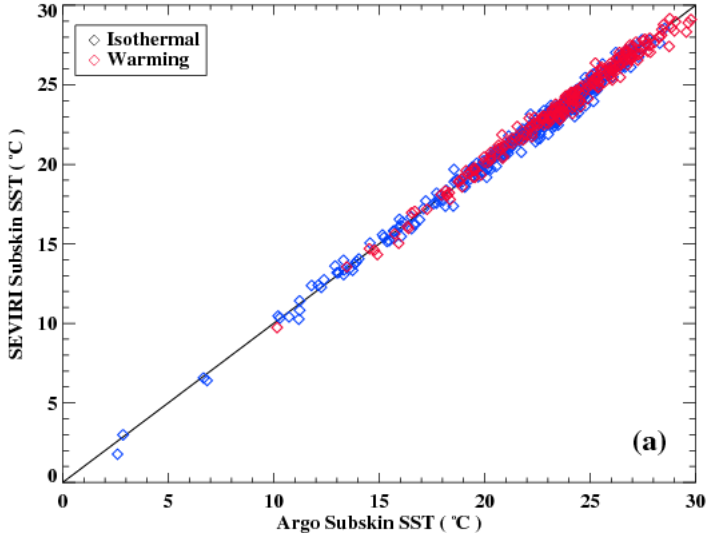



DJF
MAM
JJA
SON
60
40
20
0
−20
−40
−60
−75
−55
−35
−15
5
25
45
0
1
2
3
4
5


Nighttime Cloud Cover in SEVIRI Foundation
60
40
20
0
−20
−40
−60
−75
−55
−35
−15
5
25
45
0
20
40
60
80
100
Cloud Fraction (%)

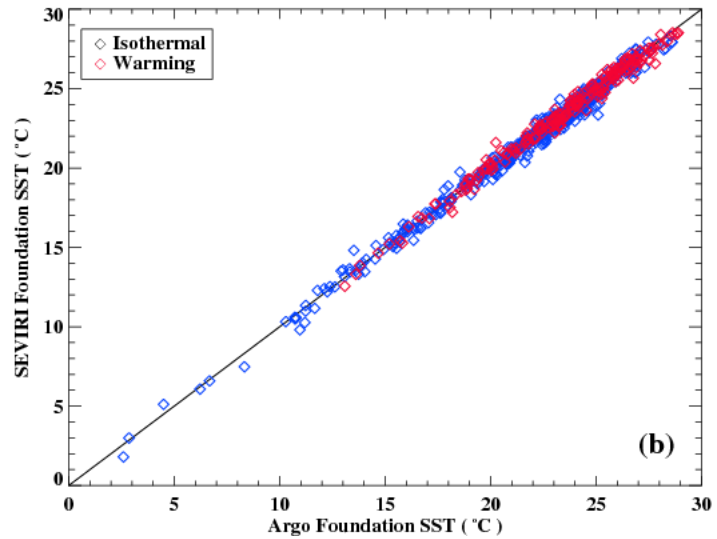
Comparison of Subskin and Foundation Estimates

Subskin SST



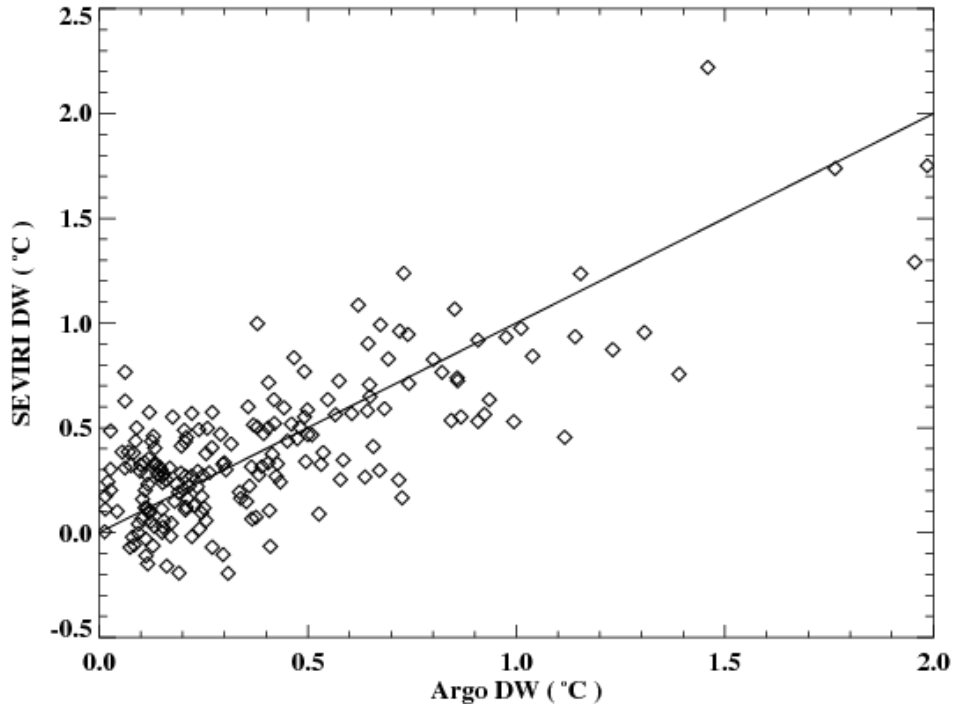
Warm	Count	Bias	Stdev	Bias	Stdev
Yes	223	-0.04	0.39	0.23	0.44
No	405	-0.10	0.37	-0.09	0.35
All	628	-0.08	0.38	0.03	0.42

Foundation SST



Warm	Count	Bias	Stdev	Bias	Stdev
Yes	211	-0.02	0.36	-0.16	0.36
No	495	-0.11	0.39	-0.10	0.38
All	706	-0.09	0.38	-0.12	0.39

Comparison of Derived Diurnal Warming



Warm	Counts	Bias	Stdev
Yes	192	0.00	0.25
No	317	0.02	0.17
All	509	0.01	0.21

Conclusions: The potential utility of Argo data for diurnal warming applications has been a key question for the DVWG

- Results demonstrate remarkable consistency between the estimates of the subskin and foundation temperatures and corresponding diurnal warming from SEVIRI and unpumped Argo. This lends support to both products and associated methodologies.
- Unpumped Argo floats provide accurate estimates of diurnal warming. They constitute a very valuable independent data set for L4 SST validation and diurnal warming studies, suggesting we advocate for more unpumped Argo floats.