Vertical land motion point-wise + interpolated trends and uncertainties for sea level studies

## Contact

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## Overview

This work is a data supplement to 'Vertical land motion reconstruction unveils non-linear effects on relative sea level changes from 1900-2150'. Two files are provided: interpolated VLM (VLM_reconstruction.nc) and point-wise VLM (Vertical_land_motion_preliminary_point_wise_trends.nc). For regional sea level projections, please use the variable 'VLM_trend_coefficient_mean' (and 'VLM_trend_coefficient_uncertainty') in VLM_reconstruction.nc. 'GRW_ensemble_std' contains uncertainty stemming from present-day VLM, which can be added to the trend uncertainties. Not all regions are resolved, so please use the point-wise trend estimates for local VLM (variable: 'trend' in Vertical_land_motion_preliminary_point_wise_trends.nc).
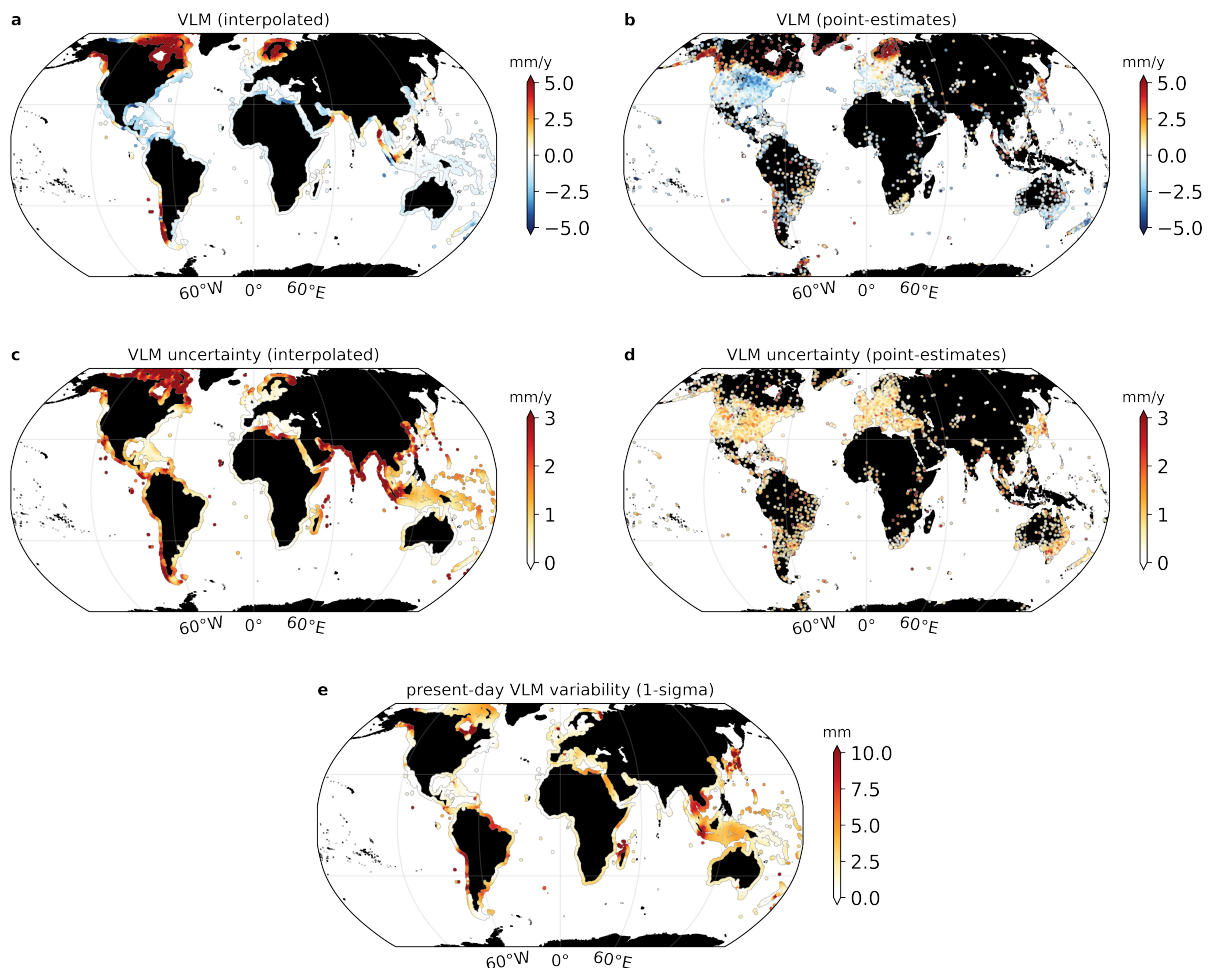


Figure: a) interpolated VLM ('VLM_trend_coefficient_mean' (and c) 'VLM_trend_coefficient_uncertainty')); b) point-wise VLM ('trend') and d) uncertainty ('trend_un'). e) shows the standard deviation of the present-day VLM variability, which captures temporal variations not contained in the trend component. Note that this information can be useful to interpret the uncertainties in c) which are also influenced by the station density and spatial VLM variability.

# Dataset description

VLM_reconstruction.nc

| dimensions: | | |
| --- | --- | --- |
| time = 175 | | |
| x = 20269 | | |
| **short_name** | **long_name/description** | **units** |
| time(time) | | days since 1990-12-31 |
| lon(x) | longitude | degrees_east |
| lat(x) | latitude | degrees_north |
| Full_VLM_reconstruction_mean | Full VLM reconstruction including trend and present day VLM variability. Height changes with respect to a time-mean of 2014 | m |
| Full_VLM_reconstruction_uncertainty | Full VLM reconstruction uncertainty including error propagation of the trend and present day VLM uncertainties. | m |
| VLM_trend_time_series_mean | Time series of the trend component of the VLM reconstruction. | m |
| VLM_trend_time_series_uncertainty | Time series of the trend uncertainty of the VLM reconstruction. | m |
| VLM_trend_coefficient_mean | Estimated coefficient of the trend component of the VLM reconstruction. | m/year |
| VLM_trend_coefficient_uncertainty | Estimated uncertainty of the trend component of the VLM reconstruction. | m/year |
| VLM_EOF_time_series_mean | Time series of the present-day VLM variability, based on the combined EOFs. | m |
| VLM_EOF_time_series_uncertainty | Uncertainty of the time series of the present-day VLM variability, based on the combined EOFs. | m |
| VLM_present_day_trend_coefficient_mean | Estimated trend coefficient based on the full VLM reconstruction. | m/year |
| VLM_present_day_trend_uncertainty | Estimated trend uncertainty based on the full VLM reconstruction. The uncertainty is estimated using a first-order autoregressive noise model (AR1). | m/year |
| GRW_ensemble_std | Standard deviation of the 1000-member-ensemble spread of the Gaussian Random Walks, which are simulated based on the estimated parameters of the present-day VLM variability. | m |
| **Global attributes** | | |
| Dataset_name | VLM_reconstruction | |
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| information | This work is a data supplement to 'Vertical land motion reconstruction unveils non-linear effects on relative sea level changes from 1900-2150' by Julius Oelsmann, Marta Marcos, Marcello Passaro, Laura Sanchez, Denise Dettmering, Sönke Dangendorf and Florian Seitz | |
| sources | Please acknowledge the following sources: The NGL-GNSS data are obtained from (http://geodesy.unr.edu, Blewitt et al., 2016). Monthly tide gauge data from PSMSL are available at https://www.psmsl.org/data/obtaining/ (Holgate et al., 2014). Gridded altimetrydata is available at https://resources.marine.copernicus.eu/product-detail/SEALEVEL GLO PHY L4 MY 008 047/INFORMATION. | |
| references | Blewitt G, Kreemer C, Hammond WC, Gazeaux J (2016) Midas robust trend estimator for accurate gps station velocities without step detection. Journal of Geophysical Research: Solid Earth | |

| | 121(3):2054–2068, DOI 10.1002/2015JB01255<br><br>Holgate SJ, Matthews A, Woodworth PL, Rickards LJ, Tamisiea ME, Bradshaw E, Fo-den PR, Gordon KM, Jevrejeva S, Pugh J (2013) New Data Systems and Products at the Permanent Service for Mean Sea Level. Journal of Coastal Research pp 493–504, DOI 10.2112/JCOASTRES-D-12-00175.1, URLhttps://doi.org/10.2112/JCOASTRES-D-12-00175.1 | |

Vertical_land_motion_preliminary_point_wise_trends.nc

| dimensions: | | |
|---|---|---|
| x = 12237 | | |
| **short_name** | **long_name/description** | **units** |
| lon(x) | longitude | degrees_east |
| lat(x) | latitude | degrees_north |
| trend | VLM (trend) | m/year |
| trend_un | VLM uncertainty | m/year |
| ID | ID of GNSS or TG (from PSMSL) | |
| **Global attributes** | | |
| Dataset_name | Vertical_land_motion_preliminary_point_wise_trends | |
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| references | Blewitt G, Kreemer C, Hammond WC, Gazeaux J (2016) Midas robust trend estimator for accurate gps station velocities without step detection. Journal of Geophysical Research: Solid Earth 121(3):2054–2068, DOI 10.1002/2015JB01255<br><br>Holgate SJ, Matthews A, Woodworth PL, Rickards LJ, Tamisiea ME, Bradshaw E, Fo-den PR, Gordon KM, Jevrejeva S, Pugh J (2013) New Data Systems and Products at the Permanent Service for Mean Sea Level. Journal of Coastal Research pp 493–504, DOI 10.2112/JCOASTRES-D-12-00175.1, URLhttps://doi.org/10.2112/JCOASTRES-D-12-00175.1 | |