A global data base for late-glacial and Holocene sea-level indicators

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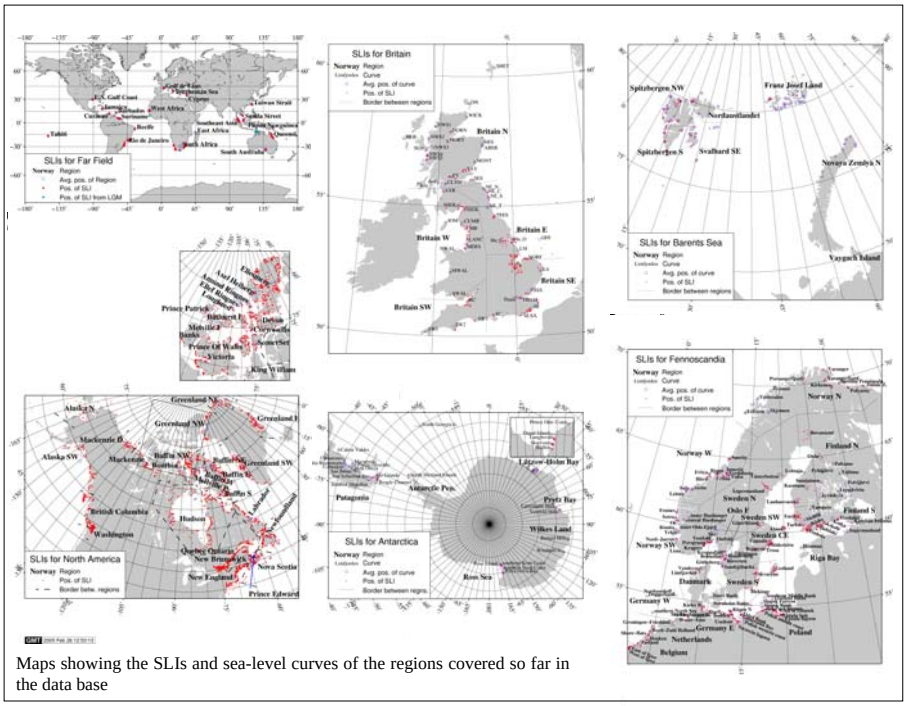
Summary

During the strategy fund program SEAL (Sea Level Change: an Integrated Approach to its Quantification) of the Helmholtz Community of German Research Centers (HGF), a global data base for late-glacial and Holocene sea-level indicators (SLIs) was established at the GeoForschungsZentrum Potsdam (GFZ). The aim was to interpret sea-level variations on a global scale over the last 20,000 a with respect to glacial-isostatic adjustment (GIA), to infer the Earth's mantle viscosity and to predict the GIA contribution to the present-day sea-level rise (e.g. Hagedoorn et al., 2006) and gravity change observed by GRACE.

In order to consider not only the standard information, such as position, age and former sea-level height characterizing a specific SLI, we decided to include a more complete suite of information about each SLI in our data base. This was one of the objectives of the IGCP Project 61 (Tooley, 1987), which initiated regional compilations, as for Canada and Britain. Its main advantage is that it allows a more sophisticated inference of former sea-level height from SLIs (e.g. Hagedoorn, 2005; Klemann & Wolf, 2006 [see also Poster No. 78]; Wolf et al., 2006).

The new data base currently used by the GIA group at the GFZ is based on compilations by Kevin Fleming (Far Field), Art Dyke (North America), Ian Shennan (Britain), and additional compilations for Antarctica and Patagonia, Barents Sea and Fennoscandia based on a scrutiny of the relevant literature (see e.g. Pirazzoli, 1991, as a rich source). In order to standardize the data storage, we decided to use a relational data-base system.

The poster presents the status quo of the data base, its structure and examples of its use. The motivation for this presentation is to refresh the idea of establishing a uniform global data base of SLIs, as formulated and started in the IGCP Project 61 (Preuss, 1980), to invite colleagues with complementary compilations to contribute to this data base and, finally, to unify existing compilations in a single and uniform data base.



Maps showing the SLIs and sea-level curves of the regions covered so far in the data base

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dyke_id | tab_name | curve | lab | lat | long | mater | loc | elev | min_rsl | max_rsl | c14_gsc | st_error | c14_rep | lat_var | long_var | elev_method | comments | ref | cal_min | cal_max | cal_sig | cal_cmt | modtime | c14_ref
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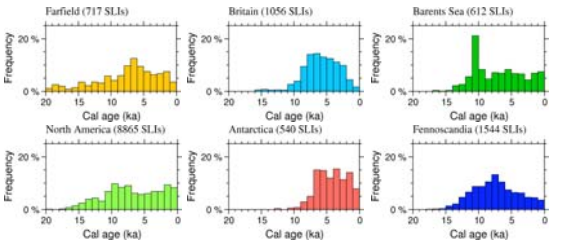
Status quo of data base

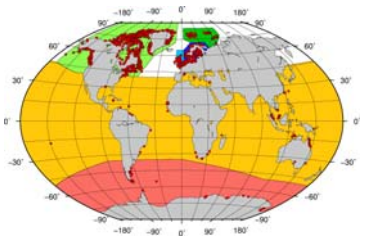
The SLI data are stored in the relational data-base system Postgres. The system allows the access of data by definition of queries in SQL and the definition of interfaces to visualisation tools, such as Generic Mapping Tools (GMT), Geographic Information Systems (GIS) or script languages for the interpretation and comparison with predictions (see Poster No. 78).

At present, the data base contains ~14,000 SLIs covering the regions shown on the maps. The histograms (right) display the number of dated SLIs for each region and their age distribution. Except for the far-field data, the SLIs are mainly from the Holocene because of their location in formerly glaciated regions.

The SLIs of the individual regions are based on different compilations. These are not standardized in one format but stored in different relations according to regions (right). Thus, the attributes suggested by their compilers are kept, only names are changed or further attributes are added if necessary. Attributes include name of the se-level curve, region and location, age, indication of upper or lower limit for sea level, dating method, coordinates, remarks on tides, comments about depositional conditions and others.



Region	Compiler	Number of attributes
Far Field	Kevin Fleming (GFZ)	32
North America	Art Dyke (Geol. Surv. Canada)	25
Britain	Ian Shennan (Univ. Durham)	24
Antarctica	GFZ	33
Barents Sea	GFZ	31
Fennoscandia	GFZ	34



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fenno_id | tab_name | curve | loc | lat | long | c14_rep | st_error | h_rsl | lab | mater | comments | ref | lat_var | long_var | age_meth | lev_meth | c14_basin | c13_corr | basin_cmt | c13_cmt | cal_min | cal_max | cal_sig | cal_cmt | h_min | h_max | ancylus | loc_cmt | tides | h_error | modtime | elev | c14_age
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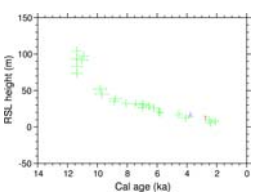
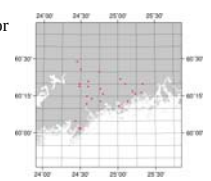
Example of presentation

Sea-level curve for the Helsinki region. SLIs from isolation events are marked in green. If the SLI only defines the beginning or end of isolation, it is marked in blue or red, respectively.



Map of SLI locations for the Helsinki region.



Credits

Special thanks are due to Art Dyke (Geol. Surv. Canada), Ian Shennan (Univ. Durham), Kevin Fleming (GFZ) for contributing their compilations to this data base and to all geologists who published their SLI data in a useful form.

References

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Wolf D, Klemann V, Wünsch J, Zhang F (2006) Surv. Geophys., 27: 19-61.