



New daily and monthly historical gridded mean sea level pressure reconstructions for the North Atlantic-European sector (EMSLP) and the globe (HadSLP2): 1850 to 2003.

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In this presentation, two historical surface atmospheric pressure data sets are detailed, evaluated and some applications for European climatic research are described. The first is a new daily gridded monthly mean sea level pressure (MSLP) compilation for the North Atlantic-European sector (EMSLP), while the second is a new version of the Hadley Centres global, monthly gridded MSLP product (HadSLP2). These data sets are of 5o x 5o latitude by longitude grid resolution, and cover the period from 1850 to 2003.

EMSLP and HadSLP2 development

The daily EMSLP data compilation was developed as part of the European Community (EC)-funded EMULATE (European and North Atlantic daily to MULTidecadal climATE variability) project which began in November, 2002. A total of 86 continental and island stations, distributed over the region 70oW to 50oE, 25oN to 70oN, were blended with marine data from the International Comprehensive Ocean Atmosphere Data Set (ICOADS) to form EMSLP. ICOADS combines the Met Office's Marine Data Bank with the previous version of COADS, and also includes several million new observations from the Japanese Kobe and US Maury collections. Daily marine gridded MSLP fields were generated using these data from 1850-1997, supplemented with National Center for Environmental Prediction (NCEP) Global Telecommunication System (GTS) data for the 1998-2003 period. EMSLP fields from 1850-1880 were based purely on the terrestrial station data and ship-based observations. From 1881, blended land and marine fields were combined with already available daily Northern

Hemisphere (north of 15°N) fields. Complete spatial coverage over the EMULATE domain was obtained by employing reduced-space optimal interpolation (RSOI).

HadSLP2 is the most recent version of the Hadley Centres historical, global, gridded MSLP data product. A major digitisation of hard copy and scanned, and collation of electronic, surface pressure data from historical sources all over the globe was performed in order to produce HadSLP2. As a consequence, it is an improvement over HadSLP1 in that the number of terrestrial stations used in its construction has increased from 718 to 1502. All data were checked for keying errors, converted to standard units, gravity and to MSLP. In addition to standard homogeneity tests, near neighbour comparisons were also made of terrestrial MSLP time series. Similar to EMSLP, HadSLP2 was constructed by blending together these quality controlled terrestrial (land and island) with the marine (ship-based) ICOADS observations. These blended and gridded fields were made spatially complete by using RSOI.

Validation of both EMSLP and HadSLP2 was performed by using a combination of an historical gridded product, developed as part of the Annual to Decadal Variability in Climate in Europe (ADVANCE) project, the 6 hourly European Centre for Medium-range Weather Forecasts (ECMWF) ERA-40 reanalysis MSLP fields, and the HadSLP1 data set. These evaluations have shown that EMSLP compares well with climatology and can resolve many extreme events. HadSLP2 also shows important improvements when compared with HadSLP1, notably at mid latitudes in both hemispheres. However, three main issues have been highlighted with regard to EMSLP.

Firstly, a smoothing procedure applied during the gridding and quality control stages has flattened the daily EMSLP fields. Secondly, during the data sparse period of 1850-1880, MSLP variance in both the far east and far west of the EMULATE region is notably lower than in the post-1880 period. This is a consequence of the RSOI procedure and data sparseness. Thirdly, during the data sparse 1850-1880 epoch, MSLP over Greenland appears to be too high in winter.

Applications of EMSLP and HadSLP2

Examples of various applications of these data sets to European climatic questions are detailed in this presentation. These include circulation patterns characterising significant floods, droughts, heat waves, cold snaps and storminess across the North Atlantic-European sector, and the extension and evaluation of climatic indices indicative of significant features of the climate system (ie. the NAO and El Niño Southern Oscillation [ENSO] phenomenon).

By their very nature, EMSLP and HadSLP2 also lend themselves to more sophisticated analyses. Both data products possess the important characteristics of long tem-

poral and spatial completeness, high quality and resolution, and are thus applicable for analyses that employ both standard and advanced signal detection techniques (cluster analyses, EOFs, MTM-SVD etc) and climate detection/attribution approaches.

EMSLP and HadSLP2 are examples of the latest in a new generation of data sets that can be used for a variety of applications ranging from the development/testing of palaeoclimatic proxies, through to historical climatology, climatic variability, and climate change studies. In conjunction with new historical sea surface temperature data sets, EMSLP and HADSLP2 will be instrumental in bringing new insights to bear on important ocean-atmosphere phenomena and questions, such as the NAO/Arctic Oscillation (AO) dichotomy, decadal ENSO signals, Interdecadal Pacific Oscillation/Pacific Decadal Oscillation signatures and the Atlantic Multidecadal Oscillation-Sahelian mode.

Future developments include a near real-time version of HadSLP (which is currently being developed), a full Northern Hemisphere daily historical MSLP data set, and a truly international and easily accessible MSLP data bank. The latter would hold gridded MSLP products, and also the various time series of terrestrial MSLP data used in various gridded compilations would ultimately be available online for use, validation and extension.

Details of EMSLP and HadSLP2 data and release dates can be found at www.hadobs.org Information on EMULATE is available at <http://www.cru.uea.ac.uk/cru/projects/emulate/> A WWW site containing information on progress towards an international MSLP data bank will soon be finalised by WMOs AOPC/OOPC Surface Pressure Working Group.