Geophysical Research Abstracts
Vol. 12, EGU2010-3923, 2010
EGU General Assembly 2010
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The terrestrial and marine observations enabling historical reanalyses: the ACRE Initiative

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Weather observations and reanalysis are perfect partners: the observations make the reanalysis possible, and the reanalysis makes optimal use of the observations in producing the comprehensive picture of the atmosphere required by both climate scientists and a host of other users. The new generation of surface-input-only reanalyses (20th Century Reanalysis Project: 1891-2006, 20th Century Reanalysis Project: 1871-2008, Surface Input Reanalysis for Climate Applications [SIRCA]: 1850-2011 and Chemical and Surface Input Reanalysis for Climate Applications [CSIRCA]: 1800-2016) therefore present both a challenge and an opportunity to observations specialists: they require an unprecedented increase in the available datasets of surface barometric pressure, sea surface temperature and sea-ice; but offer a chance to synthesise terrestrial and marine observations into a much more detailed picture of climate variability and change. The international Atmospheric Circulation Reconstructions over the Earth (ACRE) initiative is supporting this work, both undertaking and facilitating the global recovery, imaging, digitizing, quality control and archiving of daily to sub-daily global historical terrestrial and marine surface weather observations.

In this presentation, we provide an overview of the international historical terrestrial and marine data activities required to produce the quality and quantity of weather data needed in order to undertake viable historical surface-input-only historical reanalyses, ultimately extending back over the last 200 or so years. This endeavor has only been made possible because of ACRE's efforts to agglomerate a combination of the results of ongoing international data recovery initiatives, some as existing data rescue projects, and other new initiatives focusing on particular regions or countries around the world. Numerous elements and interactions are involved in such a vast enterprise, with careful consideration required in working with historical weather observations from various terrestrial and marine sources, in integrating and cross checking such data, and in recovering the meta-data needed to help data homogenization. In addition, the historical reanalyses are able to assimilate a wide range of observational data, including that from 'short' or 'broken' series. Thus, historical weather data that would often be discounted by many conventional recovery efforts because of its short length or missing values can still be valuable.

The observations collected will be held in the International Surface Pressure Data bank (ISPD) maintained by the GCOS AOPC/OOPC Working Group on Surface Pressure (WG-SP), and in the International Comprehensive Ocean-Atmosphere Data Set (ICOADS). They will be made freely available to the international scientific, climate applications, education and student communities and the general public. This will be achieved via a web-based interface that will store, allow free access to, and enable free visualisations of, the raw data, data images, meta-data through to all of the variables generated by the reanalyses.