PORA-IP

Polar Ocean Reanalysis Intercomparison Project

https://agora.fmi.fi/x/YgNFAQ

Principal investigator

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Areas of contribution

Oceanic processes

Modelling and forecasting

Sea ice processes

Data assimilation

Data archiving

Summary

Ocean reanalysis (ORA) combines observations either statistically or with a hydrodynamical model, to reconstruct historical changes in the ocean. Global and regional ORA products are increasingly used in the polar research, but their quality remains to be systematically assessed. To address this, the Polar ORA Intercomparison Project (PORA-IP) has been established following on from the ORA-IP project (Balmaseda et al. 2015 with other papers in a special issue of Climate Dynamics). Currently, the PORA-IP team consists of 20 researchers from 13 institutes and universities. The ORA-IP products with polar physics, such as sea ice, have been collected in a public database. In addition to model output, available observational polar climatologies are collected and used in the assessments. Due to the extensive variety of products, this database can be expected to
become a valuable resource also outside the PORA-IP community.

For a comprehensive evaluation of ORAs in the Arctic Ocean and the Southern Ocean several specific diagnostics are needed. The collection of PORA-IP diagnostics targets the following topics: hydrography; heat, salinity and freshwater content; ocean transports and currents; mixed layer depth; and sea-ice concentration and thickness. Based on these diagnostics, ORA mutual spread and biases against observations will be quantified, and reasons for discrepancies will be discussed. PORA-IP diagnostics results, to be published in peer reviewed journals, will provide closely related information for those interested in enhancing model predictive skill over a range of time scales including seasonal to decadal. These expected outcomes link the PORA-IP effort to YOPP.

Description

The PORA-IP project coordinates a period of intensive verification process of ORA products. It diagnoses the product-observation biases and product spread in the Arctic Ocean and the Southern Ocean in terms of hydrography; heat, salinity and freshwater content; transports across the main ocean sections and currents; mixed layer depth; and sea-ice and snow concentration and thickness. These diagnostics will complement the other ORA-IP diagnostics already published in the special ORA issue of the Climate Dynamics journal. The PORA-IP project emerged from the network of the EU-COST ES-1402 “Evaluation of Ocean Synthesis” action which also has financially supported the PORA-IP meetings. The co-ordinator, the Finnish Meteorological Institute, has been supported PORA-IP from the H2020 SPICES project. Otherwise the participating institutes and their researchers have volunteered to request and collect data; planning, preparing and carrying out the diagnostics; and collecting, writing and editing scientific manuscripts. Given the potentially very important results and the modest level of financial support, PORA-IP, as other ORA efforts and many model intercomparison projects, is proven to be a very worthwhile effort. The keenness of the participating institutes to voluntarily get organised and carry out the diagnostics also highlights the urgency and strong desire to complete such an analysis.

Currently, the participating research institutes or universities are: Alfred Wegener Institute (AWI), Germany; Barcelona Supercomputing Centre (BSC), Spain; the Bureau of Meteorology, Melbourne (BOM), Australia, the Euro-Mediterranean Center on Climate Change (CMCC), Italy; the European Centre for Medium-Range Weather Forecasts (ECMWF), UK; the Finnish Meteorological Institute (FMI, coordinator), Finland; Mercator Ocean (MERCATOR), France; Meteo-France; the Institute of Marine Research, Bergen (IMR), Norway; the Nansen Environmental and Remote Sensing Center (NERSC), Norway; Reading University (UoR), UK; the UK MetOffice (UKMO); and Université catholique de Louvain (UCL), Belgium. Some of these institutes provide ORAs for the diagnostics. The following ORA products are used (with the providing institute in parenthesis): CGLORS (CMCC), GECCO (Hamburg University), GLORYS2 (MERCATOR), GloSea5 (UKMO), ORAP5 (ECMWF), TOPAZ (NERSC), UoR (UoR), ECDA (GFDL, the USA), MOVEG2 (JMA, Japan) and EN4 (UKMO). Additionally, a range of observational products are used. In particular, a new up-to-date Arctic hydrographic climatology by Hiroshi Sumata (AWI) is used for the first time to evaluate ORAs. As a result, the PORA-IP group consists of 20 scientists from 13 institutes diagnosing the output of 10 ORAs and multiple observational data sets.

Several important outcomes that directly or indirectly support the objectives of YOPP can be expected from the PORA-IP effort. By analysing and comparing ORA products and by quantifying their biases and discrepancies, a better understanding of their skill and performance in the polar regions will be gained. This understanding will
assist in developing improved representation of key polar processes in large-scale models used for prediction and generation of reanalyses in participating institutes, and in other model development projects. Similarly, the results can be expected to assist in developing better data assimilation systems. PORA-IP results have a high potential in supporting the improvement in environmental long-range prediction capabilities through a better understanding of the performance of ORA products in the polar regions. As known, the persistence of sea-ice and ocean heat content anomalies increase the forecast skill from the long-range weather to seasonal time scales. In this context, the Polar ORA evaluation is expected to be of wide interest for the YOPP community.

In addition to scientific outcomes, there are other ways PORA-IP benefits the polar research community. First, it brings together researchers working on polar ocean prediction for whom it provides a forum for communication, collaboration, exchange of ideas and problem solving. Second, the ORA data are being collected to a common public data archive. The collected variables include global and regional fields of ocean heat and salinity content, sea-surface height, surface heat fluxes, mixed layer depth, ocean currents, sea-ice concentration and sea-ice thickness. It is very likely that such a collection of variables from the latest generation of ORAs is of interest to a wide range of ocean model analysts outside the PORA-IP team.

**Timeline**

2016-11-01 - 2017-12-25

**Provider relevant aspects**

Workshops, including virtual ones to compare diagnostics results and to prepare the manuscripts. The next workshop will be in Helsinki on 9-10 November 2016.

**Regional emphasis**

Northern hemisphere: Yes

Southern hemisphere: Yes

**Key project deliverables**

Peer-reviewed publications, one for the Arctic and another one for the Antarctic, and a public ORA-IP data base.

**Data management**
Maintained by Hamburg University accessible on ftp from http://icdc.cen.uni-hamburg.de/daten/reanalysis-ocean/oraip.html

Is data provided to WMO Global Telecommunication System

No

Real-time provision

No.