



## **H2020 - Research and Innovation Action**



### **APPLICATE**

Advanced Prediction in Polar regions and beyond: Modelling, observing system design and Linkages associated with a Changing Arctic climaTE

Grant Agreement No: 727862

### **Deliverable No. 6.4**

**Start with the archiving and dissemination of YOPP  
Analysis and Forecast Dataset**

## Submission of Deliverable 6.4

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## EXECUTIVE SUMMARY

In the framework of APPLICATE (WP6, Task 6.2), operational model output from the ECMWF Integrated Forecast System (IFS) will be archived and made available for the APPLICATE team and the scientific community for a period relevant for the Year of Polar Prediction (YOPP). This global dataset will allow performing detailed process studies and model error analysis that can help understanding the roots of model biases and forecast failures, and thus advance predictions in the Arctic and beyond. The work necessary to prepare, to archive and to disseminate the new ECMWF YOPP dataset was successfully completed and is described in this deliverable (D6.4) report. The dataset contains for now selected atmospheric variables from the control of the operational ECWMF ensemble forecasting system, at a resolution of approximately 18 km, for the period May 2017 to present. These variables are archived up to a forecast lead time of 15 days, with a 3 hourly resolution. The dataset is continuously fed as time progresses and will ultimately cover a two year period from mid-2017 to mid-2019. The preparatory work necessary to archive model tendencies from physical and dynamical tendencies, which are not archived operationally, has also been completed and these tendencies will be added in the near future to the dataset.

The ECMWF YOPP dataset can be accessed through a web portal <http://apps.ecmwf.int/datasets/data/yopp/levtype=sfc/type=cf/>, and is described at: <https://software.ecmwf.int/wiki/display/YOPP/ECMWF+contribution+to+YOPP>

## 1. Introduction

### 1.1. Background and objectives

This deliverable ensures the start of the archiving and dissemination of operational model output from the ECMWF Integrated Forecast System (IFS) following Task 6.2. Task 6.2 comprises the preparation and dissemination of operational model output from the ECMWF archives in support of forecast performance studies and model error analyses by the APPLICATE team and the global community. ECMWF already provided a similar data set in the past in support of the Year of Tropical Convection (YOTC), which produced significant impact on the science community (Moncrieff et al. 2012). Apart from process studies, the dataset can be used to force sea ice-ocean models, carry out predictability studies and serve as a basis for Transpose-AMIP experiments (Williams et al. 2013).

The objective of this deliverable is to confirm that the preparatory work necessary to archive the ECMWF analysis and forecast dataset was done, and that the archiving and dissemination of the dataset has started. This dataset will eventually contain two full years of output (mid 2017—mid 2019) that are aligned with the core phase of the Year of Polar Prediction (YOPP).

### 1.2. Organisation of this report

The report is organised as follows. Section 2 describes the preparatory work needed to create, archive and disseminate the ECMWF YOPP dataset through a webportal, Section 3 describes the data that is already available through the new webportal, and the data that is in the process of being archived. Section 4 contains a brief outlook of this stepping stone for Task 6.2.

## 2. Description of the work involved

Producing the ECMWF YOPP dataset required to, firstly, define the output fields (described in Section 3), the data structures to accommodate this data (ecCodes, MARS, and entire software stack) and the data server layout. It was also necessary to develop a suite that reformats the ECMWF output into the YOPP convention, to archive this new dataset in the ECMWF meteorological archiving system (MARS), and to set up a data catalogue on the data server (D6.2). The web interface was developed following the template of the ECMWF YOTC dataset (<http://apps.ecmwf.int/datasets/data/yotc-od/levtype=sfc/type=an/>). It was required to add disk space resources to the MARS infrastructure in order to accommodate the load added by the archiving and serving of this dataset. The data is stored following the WMO GRIB format applicable to Numerical Weather Prediction. Since the data is archived in MARS, full back-up and recovery capabilities are available, as for other operational model output.

## 3. Description of the ECMWF YOPP dataset

The new ECMWF YOPP dataset can be accessed at:  
<http://apps.ecmwf.int/datasets/data/yopp/levtype=sfc/type=cf/>.

A Web portal describing ECMWF's contribution to YOPP was also prepared and is available at:  
<https://software.ecmwf.int/wiki/display/YOPP/ECMWF+contribution+to+YOPP>

At the time of writing this report the dataset contains regular forecast output from the control (unperturbed member) of the ECMWF ensemble forecasts, which are coupled atmosphere–

ocean–sea ice forecasts. These global forecasts are performed at a horizontal resolution of approximately 18km and with 91 levels in the vertical for the atmosphere between the surface and about 80km height, and 0.25 degrees and 75 layers for the ocean.

Until now, selected atmospheric variables on model and pressure levels, and surface fields have been made available for the period May 2017 to April 2018 from forecasts starting at 00UTC and 12UTC. The fields are archived 3 hourly up to a lead-time of 360 hours.

The necessary work to produce and store model tendencies from the different dynamical and physical processes for the first 48 hours of the forecasts, which are not regularly archived, was also performed. This involved running an additional experiment, which mimics the control of the ensemble forecasts in near-real time, and performing the preparatory work to name these tendencies using the same convention used for the YOTC dataset to prepare for their archival. These tendencies will be added to the portal in the next few weeks for the period July 2017-up to real time.

## 4. Conclusions and outlook

The work for preparing the ECMWF YOPP dataset was successfully completed and this dataset will be enriched continuously up to mid-2019, on the one hand by adding regular model output as time progresses, and on the other hand by adding the process tendencies. These tendencies will be particularly useful for detailed model studies aiming to disentangle the sources of model errors in Arctic regions. Once the tendencies will become available online, the dataset will be even further advertised in the community through various means (APPLICATE, Polar Prediction Project in the framework of the World Weather Research Programme of the World Meteorological Organization, etc). The initial launch has been already announced at the YOPP launch event (<https://www.ecmwf.int/en/about/media-centre/news/2017/ecmwf-generating-dataset-year-polar-prediction>). Ocean data will eventually also be added once the technical developments necessary for storing netcdf output in MARS are finalized. Given that this is a global dataset at high resolution, the benefits for the community go beyond the study of polar regions and can be used for process studies in other regions as well.

## 5. References

Moncrieff, M. W., Waliser, D. E., Miller, M. J., Shapiro, M. A., Asrar, G. R., and Caughey, J. (2012). Multiscale convective organization and the YOTC virtual global field campaign. *Bulletin of the American Meteorological Society*, 93(8), 1171-1187.

Williams, K. D. and co-authors. (2013). The Transpose-AMIP II experiment and its application to the understanding of Southern Ocean cloud biases in climate models. *Journal of Climate*, 26(10), 3258-3274.

Official documentation regarding ECMWF IFS can be found at: <https://www.ecmwf.int/en/forecasts/documentation-and-support/changes-ecmwf-model/ifs-documentation>