SPECIAL PROJECT PROGRESS REPORT

Reporting year	2022……………………………………………………
Project Title:	HARMONIE-AROME improved data assimilations of scatterometer winds
Computer Project Account:	spptmont……………………………………………..……
Principal Investigator(s):	Isabel Monteiro……………………………………..……
Affiliation:	IPMA/KNMI……………………………………………..… …
Name of ECMWF scientist(s) collaborating to the project (if applicable)	……………………………………………………..…… ………………………………………………………..……
Start date of the project:	01/04/2020……………………………………………..……
Expected end date:	31/12/2022……………………………………………..……

Computer resources allocated/used for the current year and the previous one
(if applicable)
Please answer for all project resources

		Previous year		Current year	
		Allocated	Used	Allocated	Used
High Performance Computing Facility	(units)	1 310 000	599 455 (45%)	2 170 000	0
Data storage capacity	(Gbytes)	96 700	NA	NA	NA

Summary of project objectives

Investigate optimal strategies to use scatterometer winds in HARMONIE-AROME 4D-Var.

Summary of problems encountered

ECMWF activities preparing the HPC move to Bologna had impact on the project progress, causing delays in the ongoing experiments. However, these problems were partially overcome with full and timely support of ECMWF Support Team……...

Summary of plans for the continuation of the project

This year was dedicated to run long experiments using different approaches on the use of scatterometer winds in HARMONIE-AROME 4D-Var. New verification tools and methods were developed and implemented. Namely, verification of HARMONIE-AROME forecasts against EMADDC data. Methods to perform spatial verification in existing verification tools will be implemented.

List of publications/reports from the project with complete references

No publications yet.………………………………………………………………………………

Summary of results

1) Experimental Setup

The HARMONIE-AROME setup used in this study is the default CY43 HARMONIE-AROME 4D-Var configuration. It has two outer loops at 6 and 3 times the forecast grid resolution of 2.5 km, respectively 15 km and 7.5 km. For detailed discussion of HARMONIE-AROME 4D-Var setup the reader is referred to [Barkmeijer et al., 2021]. The model has a 2.5 km horizontal grid size and 65 levels with model top at 10 hPa (~26 km) and the lowest model level around 12 m. Lateral boundary conditions are obtained from the global ECMWF forecasts. Conventional observations assimilated into the system were obtained from MARS/ECMWF archive and scatterometer winds observations were acquired from OSI-SAF/KNMI archive. Conventional observations include surface pressure from surface stations over land (SYNOP) and sea (SHIPS) and buoys; wind observations from buoys, radiosonde and aircrafts (AMDAR and AIREP); and temperature observations from radiosondes and aircrafts (AMDAR and AIREP). Scatterometer winds used in the basic configurations were obtained from ASCAT on the 3 METOP satellites (ASCAT-A, ASCAT-B and ASCAT-C) flying during the experimentation period. Experiments are being conducted to investigate strategies for making the best use of these observations. In particular, different approaches of data thinning, superobbing (averaging in observation space) and error inflation are being tested.

2) Verification

Evaluation of model performance with different approaches for scatterometer use in the model will be primarily done evaluating forecasts against independent observations. Summary scores will be calculated over land and over the ocean. Over the ocean, independent wind data from ScatSat will be used. Over land, summary scores will be calculated using independent synop and radiosonde observations. Additionally, a methodology to verify forecasts against aircraft EMADDC data is being tested [de Haan et al., 2011] and implemented in the context of the project. Shown in Figure 1, are a 3D visualization of these data density over the domain, and wind speed bias and RMSE using 3 different approaches to aggregate observations.

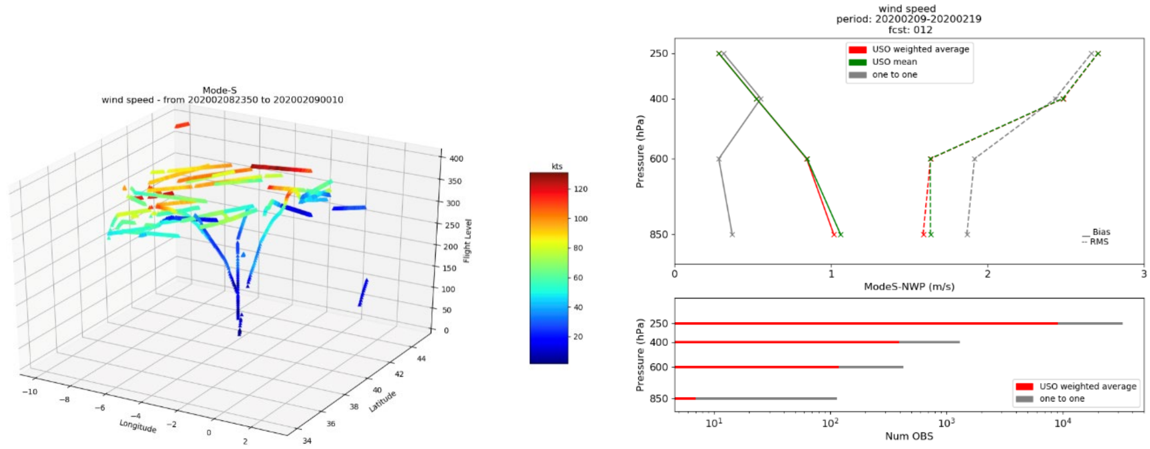

Figure 1 – left panel: EMADDC density over the 3D domain in a given 20 min time window. Right panel: wind speed root mean square error and bias for lead time 12h using 3 different methodologies to aggregate observations. Right lower panel: number of observations used to derive statistics a function of the pressure level.

References

Barkmeijer, J., M. Lindskog, N. Gustafsson, J. Bojarova, R. Azad, I. Monteiro, P. Escribà, E. Whelan, M. Ridal, J. Sánchez Arriola, O. Vignes, Roel Stappers. 2021 HARMONIE-AROME 4D-Var. ALADIN-HIRLAM newsletter nº16. http://www.umr-cnrm.fr/aladin/IMG/pdf/nl16.pdf

de Haan, S., 2011: High-resolution wind and temperature observations from aircraft tracked byMode-S air traffic control radar. J. Geophys. Res., 116, D10111, doi:10.1029/2010JD015264.