

SPECIAL PROJECT PROGRESS REPORT

All the following mandatory information needs to be provided. The length should *reflect the complexity and duration* of the project.

Reporting year 2019

Project Title: Response of midlatitude weather extremes and mean circulation to surface warming in the OpenIFS model

Computer Project Account: SPDEKJEL

Principal Investigator(s): Joakim Kjellsson
Mojib Latif

Affiliation: GEOMAR Kiel, Germany

Name of ECMWF scientist(s) collaborating to the project
(if applicable)

Start date of the project: 2019-01-01

Expected end date: 2019-12-31

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)			8 million	2,7 million
Data storage capacity	(Gbytes)			2250 Gb	27 Gb

Summary of project objectives (10 lines max)

The project SPDEKJEL running in 2019 is an extension of a previous project in 2018 and the focus of both projects is the response of the midlatitude atmosphere to surface warming. The 2018 project was relatively small and only included high-resolution simulations of 10 winters, NJDF, in 1982-1987 and 2012-2017. The 2019 project is larger and we aim to study the summer months, JJAS, and also extend the project to study the impact of surface change by the end of the 21st century. We will also systematically study the impact of surface temperature change and sea-ice change. Finally, we will also make some tests using the newest release of OpenIFS 43r3.

Summary of problems encountered (10 lines max)

We do not have access to prepIFS, and so must request initial conditions and surface forcing files from the OpenIFS support team which has been overburdened during most of 2019 as much time has been spent on releasing OpenIFS 43r3. Furthermore, as 43r3 is yet to be released we have not been able to make simulations with it. However, these issues are likely to be resolved in the very near future.

Summary of plans for the continuation of the project (10 lines max)

Even though the project is half way through, we have not completed half of the simulations. We aim instead to complete the majority of simulations during the second half of 2019.

List of publications/reports from the project with complete references

None.

Summary of results

If submitted **during the first project year**, please summarise the results achieved during the period from the project start to June of the current year. A few paragraphs might be sufficient. If submitted **during the second project year**, this summary should be more detailed and cover the period from the project start. The length, at most 8 pages, should reflect the complexity of the project. Alternatively, it could be replaced by a short summary plus an existing scientific report on the project attached to this document. If submitted **during the third project year**, please summarise the results achieved during the period from July of the previous year to June of the current year. A few paragraphs might be sufficient.

While we have not started production of the proposed simulations yet, we have performed complimentary runs for the previous project from 2018. We have started experiments using a medium-resolution configuration of OpenIFS where we change either surface temperature or sea-ice cover.

We were given access to a beta-release of OpenIFS 43r3 in early July for testing, and have performed some short test runs with a low-resolution configuration (Fig 1). These tests were successful but also showed some instabilities. We therefore await the official release of OpenIFS 43r3 before launching simulations for this project.

We have also developed the proper scripts to analyse the energetics of the midlatitude planetary waves and got early results using a T159L91 and T511L91 simulations (Fig 2). We find significant differences between the T159 and T511 simulations both in the magnitude of EKE and the location of the EKE maximum on the spectrum. We aim to continue this analysis on the T1279 simulations from this project.

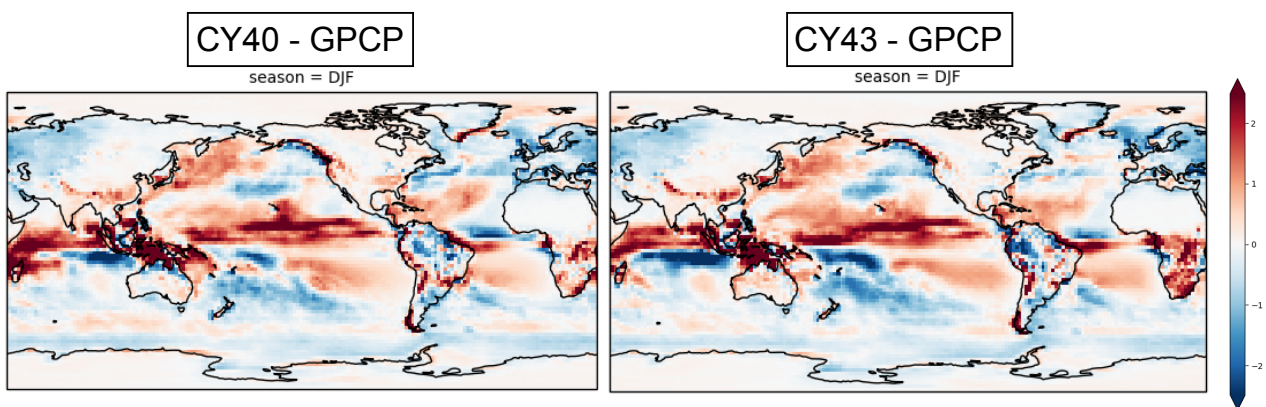


Fig 1: Precipitation bias in T159L91 simulations with 40r1 and 43r3 versions of OpenIFS.

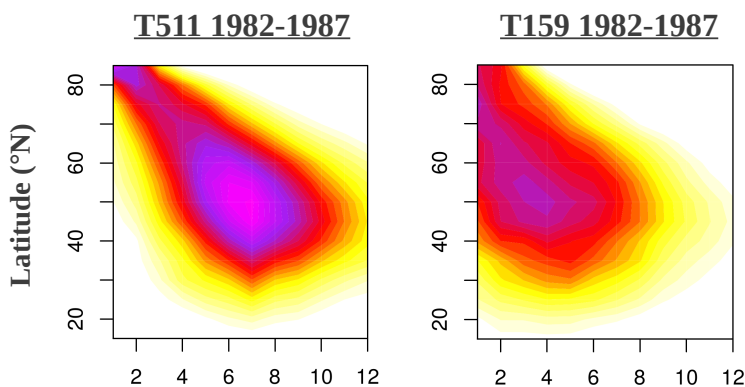


Fig 2. Kinetic energy as a function of latitude and wave number.