SPECIAL PROJECT PROGRESS REPORT

Progress Reports should be 2 to 10 pages in length, depending on importance of the project. All the following mandatory information needs to be provided.

Reporting year ……2010……

Project Title: … Interactions between the Atlantic Ocean, African monsoon, the Indian and Pacific Oceans using the EC-Earth and IFS modelling systems

Computer Project Account: ……SPITDIPO……

Principal Investigator(s): …Fred Kucharski……

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Affiliation: Abdus Salam International Centre for Theoretical Physics (ICTP)

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

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Start date of the project: …30.04. 2010……..……

Expected end date: …30.12. 2012……..……

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)	500,000	500,000	500,000	500,000
Data storage capacity	(Gbytes)	1000	?	1000	?

Summary of project objectives

(10 lines max)

Previous work has shown the possibility that the tropical Atlantic has an unexpectedly strong Influence on the Indian Ocean, Indian Monsoon and Pacific Ocean.
Since most of these studies are based only on observational data and intermediate complexity model simulations, the aim of this project is to use the latest state-of-the-art modelling systems EC-Earth and/or the IFS to confirm and refine the various hypothesises that have been made previously. Relatively high-resolution and complex physics simulations are essential to increase confidence in the hypothesis that the tropical Atlantic may have a much stronger impact on the surrounding ocean and land masses than previously thought. However, also simulations with the intermediate complexity ICTPAGCM coupled to OPA/NEMO will be performed, because the efficiency of this model enables to assess and validate new techniques quickly.

Summary of problems encountered (if any)

(20 lines max)

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Summary of results of the current year (from July of previous year to June of current year)

This section should comprise 1 to 8 pages and can be replaced by a short summary plus an existing scientific report on the project

The project started in April 2010. Therefore, the project is still at its very beginning. Nevertheless, The first 44-year long control simulation with EC-Earth has been conducted, archived and analysed in order to have a reference for the future sensitivity experiments. The integration has been performed at the EC-Earth standard resolution of T159 with 62 vertical levels.
Figure 1 shows the JJAS SST bias in the simulation, averaged over the last 34 years. It shows that the model has a cold bias of about 1 K over most of the Pacific, apart from the eastern Pacific where a warm bias occurs. In the tropical and south tropical Atlantic there is a pronounced warm bias which is common to many coupled models. Overall the SST bias compares well with those of other coupled models. Figure 2 shows the JJAS precipitation and 850 hPa wind climatologies compared to CMAP data and re-analysis for the region of interest (African and Indian monsoon regions). The model is reproducing overall reasonably well rainfall and wind climatologies, although the rainfall in the Atlantic region is shifted too far southward compared to observations. This feature is presumably due to the pronounced warm bias in the south tropical Atlantic, and thus common to many CGCMs.
Given that EC-Earth reproduces the observed climatologies well, as a next step some aspects of the models' variability has been analysed. The first example is the models' response to ENSO forcings. Figure 3 shows the global SST regressions onto the Nino3.4 index for the Hadley Centre SST dataset and for the EC-Earth model. The mode is able to reproduce the observed ENSO magnitude and pattern well. Finally, Figure 4 shows the influence of ENSO on JJAS precipitation by means of a regression analysis with the Nono3.4 index. Again, overall the model reproduces well the drying observed in the African region and partially also that in the larger Indian region. Also the wind response is well reproduced in the EC-Earth model. Some discrepancies can be found in the Indian subcontinent and Bay of Bengal. In the Atlantic region the responses seem to be too far south, likely due to the large Atlantic SST warm bias.

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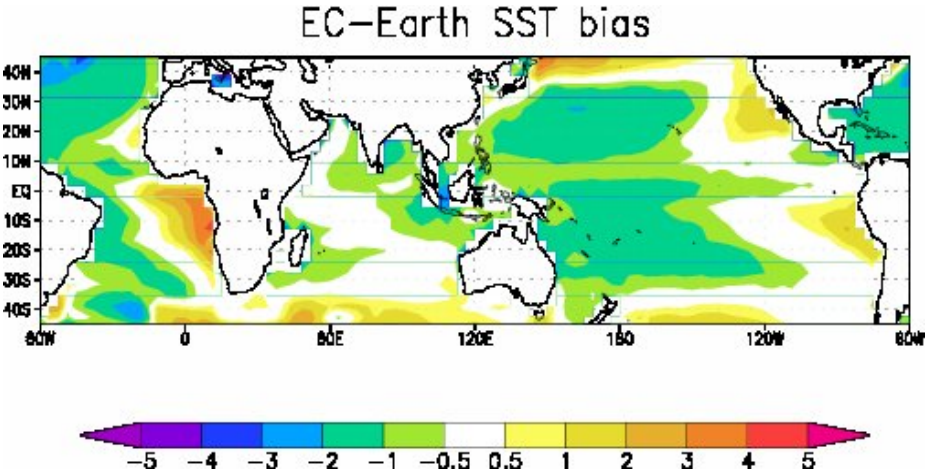

Figure1: EC-Earth JJAS SST bias. Units are K ……

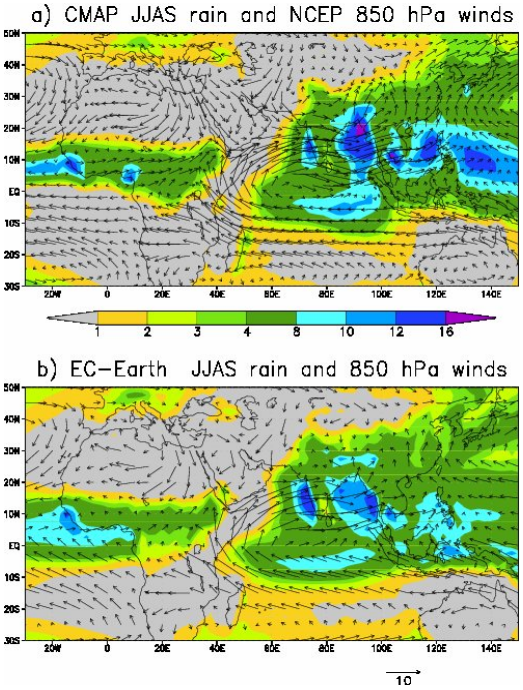

Figure 2: Comparison of EC-Earth precipitation and 850 hPa winds with CMAP Observations and re-analysis. Units are mm/day for precipitation and m/s for wind.

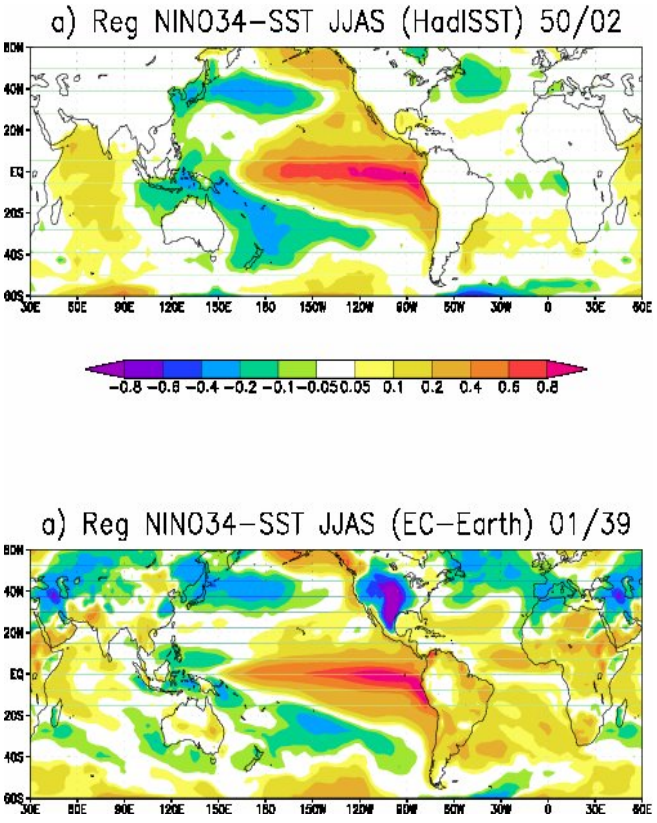

Figure 3: Global regression of SSTs onto the Nino3.4 index for observations (upper panel) and the model (lower panel). Units are K.

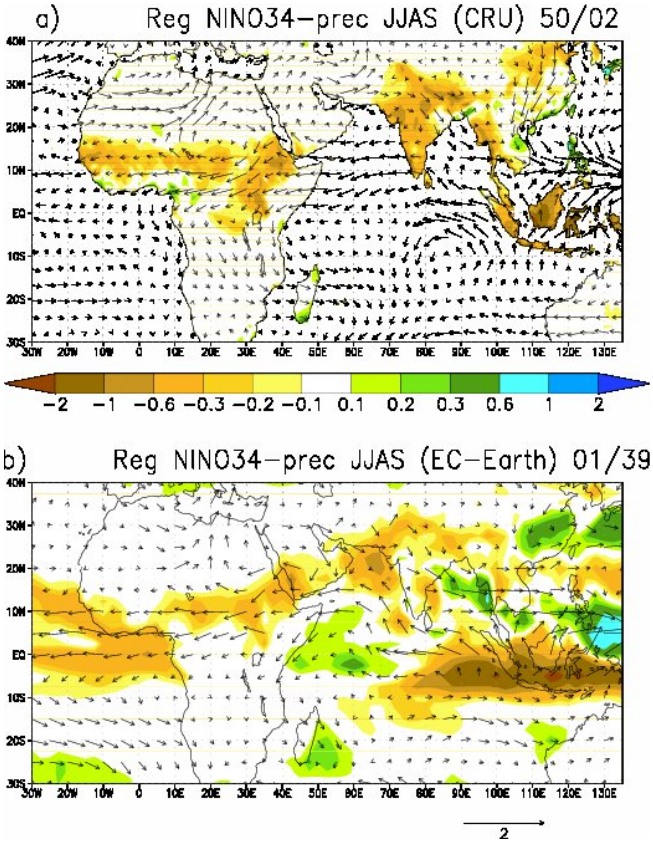

Figure 4: Regressions of precipitation and 850 hPa winds onto the Nino3.4 index. a) CRU observations and re-analysis winds, b) EC-Earth model. Units are mm/day for precipitation and m/s for wind.

List of publications/reports from the project with complete references

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……None yet……

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Summary of plans for the continuation of the project

(10 lines max)

In future, the EC-Earth control run will be further analysed. Especially the tropical Atlantic Influence on rainfall and winds will be assessed in details. After having done this, we will

Start the first idealized sensitivity experiments, in which SSTs in the tropical Atlantic will be replaced by observed ones in order to assess the influences of SST biases and SST variability on the teleconnections.