

# REQUEST FOR A SPECIAL PROJECT 2010–2012

**MEMBER STATE:** Federal Republic of GERMANY

**Principal Investigator<sup>1</sup>:** HD Dr. A.H. Fink (formerly Prof. Dr. P. Speth)

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**Other researchers:** Dr. J. G. Pinto

**Project Title:** Interpretation and calculation of energy and moisture budgets

If this is a continuation of an existing project, please state the computer project account assigned previously.	SPDEENER _____	
Starting year: <small>(Each project will have a well defined duration, up to a maximum of 3 years, agreed at the beginning of the project. For projects started before 2009, please state 2009 as the start year.)</small>	2009	
Would you accept support for 1 year only, if necessary?	YES <input type="checkbox"/>	NO X <input checked="" type="checkbox"/>

<b>Computer resources required for 2010-2012:</b> <small>(The maximum project duration is 3 years, therefore a continuation project cannot request resources for 2012.)</small>	2010	2011	2012
High Performance Computing Facility (units)	120	120	
Data storage capacity (total archive volume) (gigabytes)	30	30	

An electronic copy of this form **must be sent** via e-mail to: *special\_projects@ecmwf.int*

Electronic copy of the form sent on (please specify date): 30 April 2009

*Continue overleaf*

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<sup>1</sup> The Principal Investigator will act as contact person for this Special Project and, in particular, will be asked to register the project, provide an annual progress report of the project's activities, etc.

**Principal Investigator:** HD Dr. A.H. Fink (formerly Prof. Dr. P. Speth)

**Project Title:** Interpretation and calculation of energy and moisture budgets

## **Extended abstract**

for the Special Project

- Interpretation and calculation of energy and moisture budgets -

A.H. Fink, J. G. Pinto, Universität zu Köln, Germany

Operational analysis, forecast data, and Re-analysis from ECMWF are used to calculate budgets of quantities related to the energetics and moisture and to study the impacts of upper tropospheric eddies and surface cyclones. Investigations concern eddies and cyclones in the mid-latitudes, with emphasis on the European / Mediterranean / North African area as well as on tropical Africa. Disturbances in the West African monsoon area (partly related to the African Easterly Jet and the Tropical Easterly Jet) are also considered. The large scale conditions, which are relevant for eddy growth and for their impacts, are identified.

The variability of the budget terms and eddy activity itself is considered on time scales from several years down to days. On the shortest time scales, the particular conditions leading to extreme events (storms, rainfall) are more closely considered. Baroclinicity and latent heat content of the atmosphere are computed as their anomalies may give rise to conditions that have a high risk of extreme event occurrence. Understanding the impacts of the eddies (or the absence of strong impacts) additionally requires the diagnosis of moisture and momentum budgets. With respect to moisture, remote sources and their variability are identified, and compared to the importance of regional/local sources (water re-cycling by evapotranspiration). Transport paths are computed using trajectories. On the longer timescales, the modulations imposed by the large scale atmospheric patterns (in particular the North Atlantic Oscillation) and the upper air jets (like the Polar, Subtropical, and Tropical Easterly Jets) are of interest.

Estimates of impacts cannot be limited to quantities derived from ECMWF products, as these may be strongly influenced by the underlying model, the data available, and the assimilation scheme. Other data sources (in particular station data, but also estimates from satellite missions) are also employed for validation purposes. Quality checks of the ERA-Interim Re-analysis will be performed by relating them to independent observational data sets and by diagnoses of atmospheric processes. With respect to the diagnosis of long term variability, other datasets (for example, the NCEP re-analysis, or model simulations with GCMs) are used for intercomparison.