



6-month progress report

Period: 1 September 2004 to 28 February 2005

Prepared by: Susanna Corti on: 14 February 2005

For partner: ISAC-CNR

In WP: RT4 WP4.4

Partner's key personnel in this WP

Name	Email address, Telephone/Fax	Address
Susanna Corti	s.corti@isac.cnr.it tel +390516399603 Fax +390516399658	ISAC-CNR Via Gobetti 101 40129 Bologna Italy

Partner's resources used in this period	Funded	Unfunded
Person months effort	0	0.5
Approximate total costs		2'000.00 €

Summary of achievements this period:

Vertical structure of flow regimes: preliminary results from the NCEP reanalysis dataset.

The 50-yr NCEP/NCAR reanalysis dataset is used to explore the vertical structure of (global) circulation regimes.

The data-set consists of Northern Hemisphere extended-winter (November to April) monthly means (1948-1998) of: (i) geopotential height at 500 hPa; (ii) temperature at 700 hPa; (iii) surface temperature; (iv) mean sea level pressure; (v) wind at 200 hPa; (vi) wind at 850 hPa.

The seasonal cycle is removed by computing anomalies with respect to the long-term monthly mean. The data is further detrended by taking deviations from a 5-year running mean.

A simultaneous analysis of the all fields is carried out performing a (combined) EOF analysis in the subspace spanned by the 20 leading EOFs of each field. This produced a multi-variable EOF picture of the large-scale vertical structure of the atmosphere.

The following diagnostic tools are then applied: (i) Probability Density Functions are generated to detect local maxima in the reduced phase space spanned by the first two multi-variable EOFs. (ii) Partitioning cluster technique in the 2-EOFs phase space. The significance of the clustering for given cluster number is assessed compared to a multivariate red noise synthetic dataset.

Results:

- The PDF of the projection coefficients of the non-detrended monthly mean field in the reduced phase space spanned by the first two multi-variable EOFs is a multimodal distribution with 3(4) maxima.
- The application of the partitioning clustering algorithm to the projection coefficients confirms the significance of a 3(4) cluster classification. A 3-cluster partition is more significant when the all observed record is considered, while the

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significance of 4-cluster partition is higher during the second half of the record and when the ENSO events are removed.

- The 3 clusters in the 3-cl partition correspond to: COWL, NAM (in its positive phase) and NAO (in its negative phase). When a 4-cl partition is considered both phases of COWL and NAM are found.
- The 500-hPa height geographical patterns of both the density maxima and the cluster centroids are consistent with most of hemispheric clusters found in the literature.
- The increase in hemispheric-mean temperature in recent years seems, in part at least, directly associated with an increase in the frequency of cluster-A flow which is related to a positive surface temperature anomaly over Western North-America, North Europe and Siberia.
- ENSO does affect the regime frequencies and structure: the significance of the global cluster partition (for 2 trough 6 clusters) decreases to 79-71% when the major cold events are discarded (i.e. when the warm events weight more).