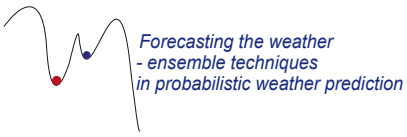
EMS Annual Meeting Abstracts
Vol. 8, EMS2011-5-1, 2011
11th EMS / 10th ECAM


# The Northern Hemisphere Temperature during the Twentieth Century: Trend Break and Intermonthly Dissimilarities

M. Ivanov (1,2) and S. Evtimov (1)

(1) Bulgaria (Martin.Ivanov@meteo.bg) Bulgarian National Institute of Meteorology and Hydrology, (2) University of Sofia, Bulgaria

# The Northern Hemisphere Temperature during the Twentieth Century: Trend Break and Intermonthly Dissimilarities

Martin A. Ivanov[a,b*] and Stilian N. Evtimov[a]

March 23, 2011

**Abstract**

Besides gradually climate can change abruptly. The global surface temperature series is a major indicator of such changes. Using rigorous statistical tools we show that during the twentieth century the time series of annual Northern Hemisphere surface temperature is well described by a trend-stationary process, but the trend line breaks in 1963. After six transitory years, in 1970 the temperature course locks up into a new regime with a triple linear warming rate. For the emergence and abruptness of the break we reveal the key roles of the Mount Agung eruption and the interannual to interdecadal changes of the major modes and patterns of climate variability. We offer an abrupt climate shift scenario based on the adaptivity of climatic regimes against instant external forcings.

We show that observed intermonthly dissimilarities between the temperature anomaly series for the Northern Hemisphere during the twentieth century are determined by two factors: radiative and dynamical. On the low-frequency scale, that is from interannual to interdecadal, operate the radiative and the low-frequency component of the dynamical factor. The radiative factor physically implicates primarily the thermodynamic feedbacks associated with the components of the cryosphere. It is manifested throughout the year, but best during the warm season. The low-frequency component of the dynamical factor is represented by the North Atlantic thermohaline circulation and is manifested during the warm season. On the high-frequency scale, that is from intermonthly to interannual, only operates the high-frequency component of the dynamical factor, physically associated with the intensity of the eddies coupled to the large scale zonal flow. It is manifested during the cold half-year. There are three seasons in the climatology of global temperature anomalies: summer (May-October), autumn (November and December) and winter (January-April).

KEY WORDS Northern Hemisphere temperature anomalies; trend break; abrupt climate shift; global seasonality; radiative factor; dynamical factor

*Correspondence to: Martin A. Ivanov, 1784, 66 Tsarigradsko Shausse Blvd., Bulgarian National Institute of Meteorology and Hydrology, Bulgarian Academy of Sciences, Sofia, Bulgaria, phones: +35929744409, +35929733569, +359878449016.
E-mail: Martin.Ivanov@meteo.bg