Geophysical Research Abstracts,
Vol. 11, EGU2009-2560, 2009
EGU General Assembly 2009


# Effects of El Nino and La Nina events on water and carbon budgets of tropical rain forests in Central Sulawesi, Indonesia

A. Oltchev (1), O. Panferov (2), H. Kreilein (2), J. Priess (3), S. Erasmi (4), K. Radler (2), and G. Gravenhorst (2)

(1) A.N. Severtsov Institute of Ecology and Evolution of RAS, Moscow, Russia (aoltche@gmail.com), (2) Department of Bioclimatology, Büsgen Institute, Georg-August University, Buesgenweg 2, Goettingen, Germany, (3) Centre for Environmental Systems Research, Kassel, Germany, (4) Department of Cartography, Institute of Geography, Georg-August-University, Göttingen, Germany

Effects of the large scale atmospheric-oceanic ENSO (El Niño-Southern Oscillation) phenomena of the equatorial Pacific on weather conditions and CO2 and H2O budgets of the tropical rain forest in Central Sulawesi (Indonesian archipelago) is quantified using results of model simulations in regional and local scales. For modeling analysis the period from 1995 to 1999 with the strongest El Niño (1997-98) and La Niña (1999-2000) events was selected. To characterize the intensity of an ENSO event the 3-month running means of SST anomalies in Niño 3.4 region (5°N-5°S, 120°W-170°W) or Oceanic Niño Index (ONI) of NOAA was chosen. The warm (El Niño)/cold (La Niña) event threshold is defined as ONI>0.5° / ONI<-0.5° for 5 consequent months, respectively.

In the first step, the regional daily patterns of meteorological conditions for the period 1995 to 1999 was derived using the regional SVAT model SVAT-Regio (Olchev et al. 2008a). As input parameters the meteorological data of the German Weather Service was used. In the next step, the temporal variability of CO2 and H2O fluxes during the ENSO events was simulated by a local process-based model Mixfor-SVAT (Olchev et al. 2008b) for two typical forest sites: Nopu (120°05' E, 01°11' S) and Bariri (120°11' E, 01°40' S) located in northern and southern parts of study area. Meteorological conditions in selected forest sites were quite different (Bariri is more wet, and Nopu – more dry). In modelling experiments it was assumed that the forest structure at both experimental sites is the same.

Analysis of regionalised meteorological data showed that the impact of ENSO events in Central Sulawesi is manifested in changes of meteorological regime especially during the period from November to May. El Niño is characterized by anomalous alternation of periods with very wet and dry weather, and La Niña – by weather without significant changes. For both experimental sites the maximal evapotranspiration and transpiration rates were simulated for period from February to July 1997 (transition from La Niña to El Niño period) mainly due to higher amount of precipitation and high solar radiation. Maximal NEEs of CO2 were modelled from January to June 1996 (La Niña) and in November – December 1998 (beginning of La Niña of 1999-2000). Minimal NEEs were modelled in January - February 1995 (end of El Niño of 1994-1995) and from September 1996 to November 1997 (transition from La Niña to El Niño period). Modelling results show that despite of very low precipitation during El Niño January-March 1998 no significant decrease of evapotranspiration and transpiration rates were obtained. Soil moisture in this period didn't reduce significantly (down to 75% of field capacity) mainly due to saturation after anomalously high precipitations in November - December. At the same time, higher solar radiation and air and soil temperatures resulted in higher respiration of forest ecosystem and, therefore, in some reduction of NEE in these months.