



Modelling estimations of El Niño and La Niña impacts on water and carbon budgets of tropical rain forest areas in Central Sulawesi (Indonesia)

A. Olchev (1), O. Panferov (2), H. Kreilein (2), J. Priess (3), S. Erasmi (4), G. Gravenhorst (2)

(1) A.N. Severtsov Institute of Ecology and Evolution of RAS, Moscow, Russia
(aoltche@migmail.ru)

(2) Institute of Bioclimatology, Georg-August University, 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 microclimatic conditions and CO₂ and H₂O budgets of the tropical rain forest margins in Central Sulawesi (Indonesian archipelago) was described using results of the model simulations in regional and local scales. The largest El Niño events in this area during the 15 years were observed in 1990-95, 1997 and 2002-2005. The largest La Niña events in this area during the 15 years were observed in period from 1998 to 2000. Analysis of available meteorological data showed that the impact of El Niño/La Niña events in Central Sulawesi is manifested mainly in changes of precipitation, cloudiness and temperature regimes especially for period from Mai to October. During El Niño period this area is characterized more dry and warm weather conditions, and during La Niña – more rainy weather. It is obvious that such changes may have significant impact on both seasonal and daily variability of CO₂ and H₂O fluxes and their annual sums.

Since 2000 the area of the Central Sulawesi is the main object of intensive experimen-

tal and modeling studies within the frameworks of the international bilateral German-Indonesian project STORMA (SFB 552) that is focused mainly on studies of stability of rain forest margins in Indonesia under climatic and anthropogenic changes. Since 2002 meteorological network including 10 mobile stations spatially distributed within the study area was created. This network provides continuous meteorological measurements within study area that allow to precisely describe the spatial and temporal pattern of meteorological parameters and to quantify their spatial gradients. In 2002 the 70 meters meteorological tower was constructed at an experimental site located in mountainous tropical rain forest near Bariri village to provide continuous eddy covariance measurements of H_2O and CO_2 fluxes between forest and the atmosphere.

To describe the energy, H_2O and CO_2 fluxes between a tropical rain forest and the atmosphere and to quantify effect of ENSO on H_2O and CO_2 fluxes during period without measurements the two process-based SVAT models (Mixfor-SVAT and SVAT-Regio) were applied (e.g. Ibrom et al. 2007). Both models are based on closely coupled description of H_2O and CO_2 exchange processes at different spatial scales from individual leaf to tree, plant canopy and geographical region. Both models were validated using results of flux measurements obtained at meteorological tower in Bariri and showed a very high correlation between measured and modeled H_2O and CO_2 fluxes. For spatial reconstruction of meteorological data within study area for periods of historical ENSO events the measured data from the Indonesian weather service were used.

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