

A03

Influence of tropical land-use transformations on local and regional climate in Sumatra/Indonesia

Ana Meijide, Merja Tölle, Mathias Herbst, Oleg Panferov, Alexander Knohl

Tania June, Akhmad Faqih, M. Ardiansyah, Dodo Gunawan, Heri Junedi, Irianto, Abdul Rauf

Project summary

Land transformation from natural to managed ecosystems such as oil palm plantations might result in changes of greenhouse gas fluxes (CO_2 and CH_4) and of local and regional climate due to land-atmosphere feedbacks after changed surface properties. In this project, we will combine measurements and modeling approaches to study the exchange of greenhouse gases (GHG) and biophysical feedbacks between land and atmosphere.

Aims

- To estimate CO_2 , CH_4 and energy fluxes in an oil palm plantation in the province of Jambi and to assess its GHG balance
- To establish relationships between GHG fluxes and environmental variables
- To study the effects of increasing oil palm plantations in the area on regional and local climate

Methods – experimental

Installation of an eddy covariance (EC) flux tower for measuring CO_2 , CH_4 and energy fluxes in an oil palm plantation and of meteorological variables.

Methods – modelling

Increasing oil palm plantations area at the expense of forest - does the regional and local climate respond?

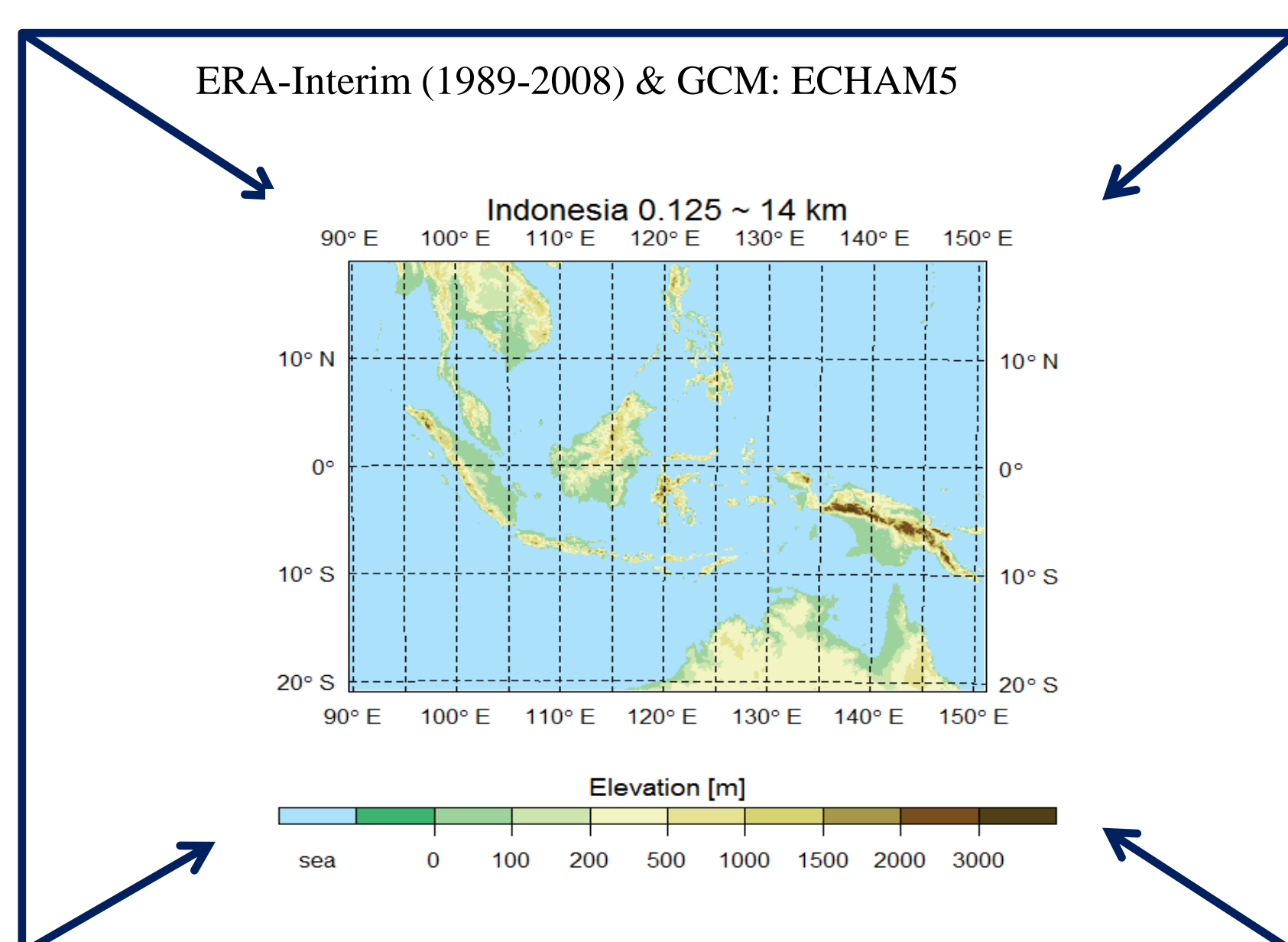
1. Large-Scale Climate

- Present: ERA-Interim and General Circulation Model (GCM) ECHAM5/MPI-OM, ref. Scenario C20 run 1
- Future: ECHAM5/MPI-OM SRES Scenario A1B run 1

2. Regional Climate with Land use effect

- Regional Climate Model (RCM): non-hydrostatic COSMO-CLM (v4.8_17) coupled to Community Land Model

3. Using 1 and 2 to study the impact land use and cover change (forest → oil palms) on the local and regional climate of Indonesia

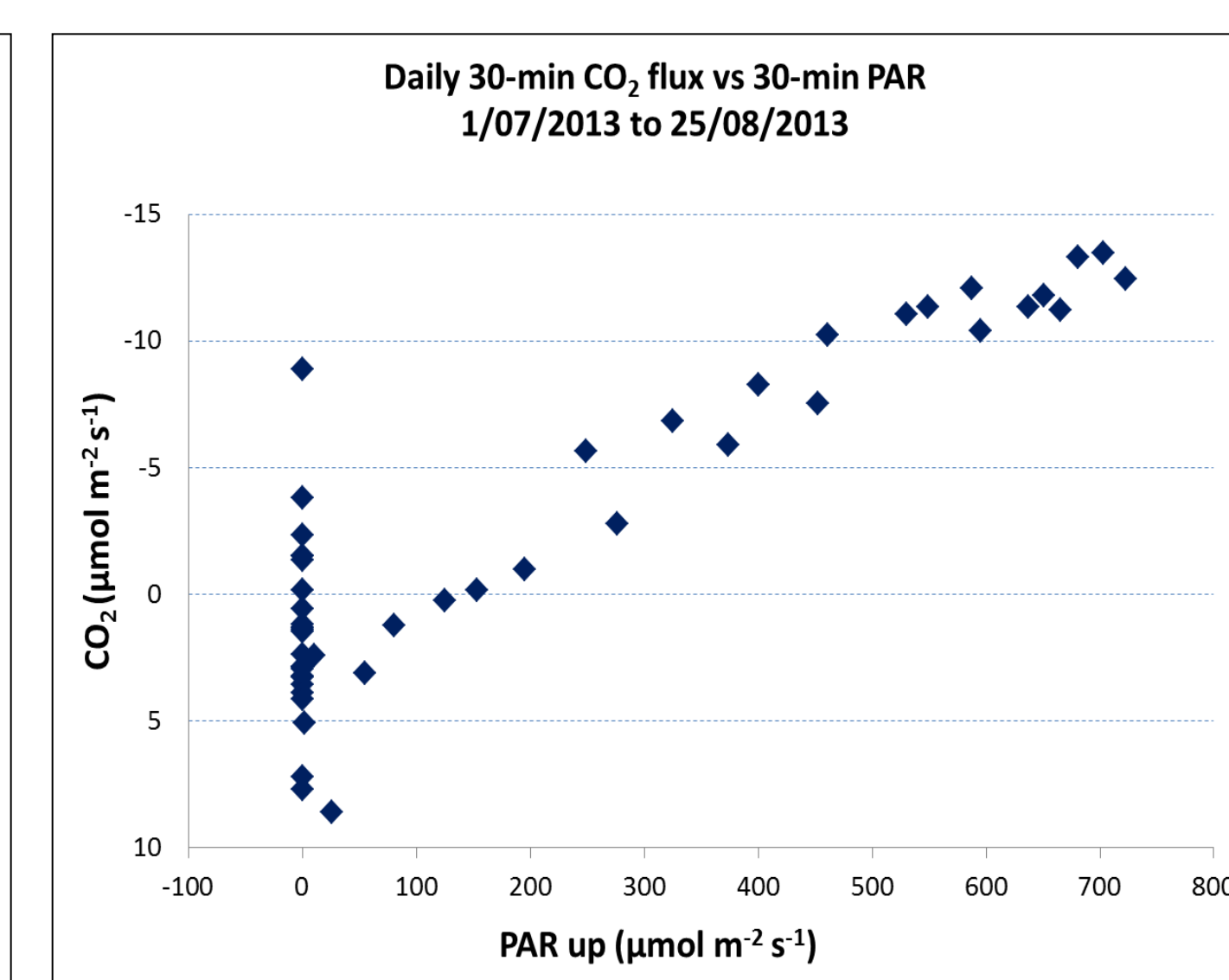
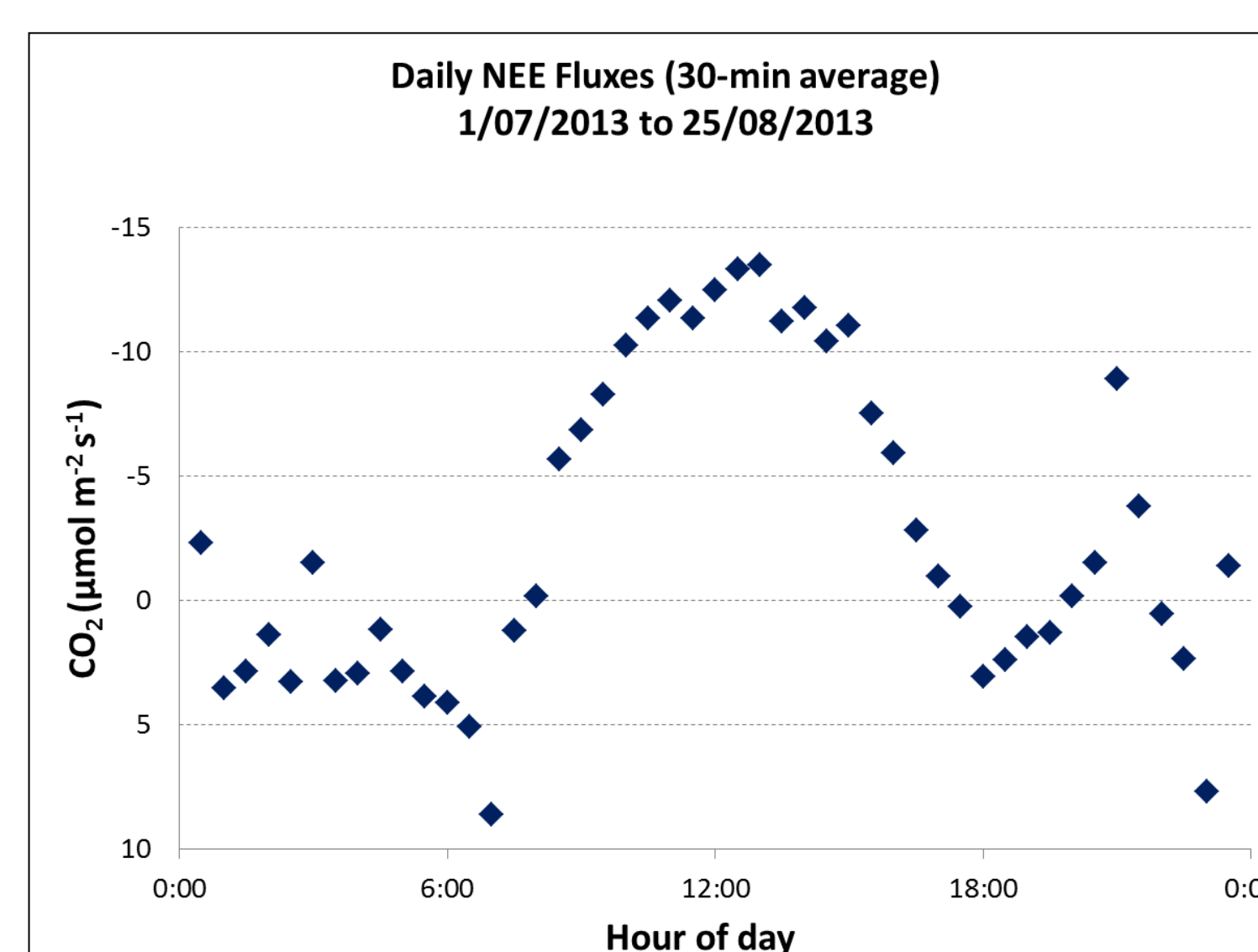


Status

- 7 m tower installed in a young oil palm plantation (2 years old) in Pompa Air. Measurements started in July 2013
- Eddy covariance CO_2 and H_2O fluxes, meteorological variables
- 22-25m tower to be installed in older oil palm plantation (PTPN VI). Additional measurements:
 - CH_4 EC measurements
 - CO_2 and H_2O profile
 - Comparison of EC from open and closed path analyzers



Preliminary results



CO_2 exchange during the day, associated with increasing PAR

