Project: **901**

Project title: **Fire in the Earth system - Injection heights**

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Report period: **1.1.2014 - 31.12.2015**

Text: maximum of two pages incuding figures.

Within the project 901 a prognostic treatment of fire emission injection heights (FEH) was implemented into the ECHAM6 model extended by the aerosol microphysical scheme (HAM). The **ECHAM6-HAM2.2-FEH** model has been tested and evaluated in a number of simulations and has been subsequently applied in various studies investigating the impact of fire emission injection heights on the wildfire climate impact for both present day and future climate conditions. Overall, the project resulted in the following publications:

(1) Veira, A., Kloster, S., Wilkenskjeld, S., & Remy, S. (2015). Fire emission heights in the climate system - Part 1: Global plume height patterns simulated by ECHAM6-HAM2. *Atmospheric Chemistry and Physics, 15*, 7155-7171.

This publication describes the implemented plume height parameterization and analysis a number of simulations in order to evaluate the model performance and test its sensitivity to various forcing factors.

(2) Veira, A., Kloster, S., Schutgens, N., & Kaiser, J. W. (2015). Fire emission heights in the climate system - Part 2: Impact on transport, black carbon concentrations and radiation. *Atmospheric Chemistry and Physics, 15*, 7173-7193.

This publication applies the newly developed ECHAM6-HAM2.2-FEH model to investigate the impact fire emission heights on the climate impact of wildfire aerosol emissions. The new model is compared in various simulations to different assumptions on emission heights including extreme cases such as pure surface emissions or emissions solely into the free troposphere.

(3) Veira, A., Lasslop, G., Kloster, S. (submitted). Wildfires in a warmer climate: Emission fluxes, emission heights and black carbon concentrations in 2090–2099, JGR, under revision.

This publication applies the newly developed ECHAM6-HAM2.2-FEH model in combination with JSBACH-SPITFIRE simulations. JSBACH-SPITFIRE simulations were performed to model wildfire activity under present day and future climate conditions. These simulations served as input for the atmospheric model ECHAM6-HAM2.2-FEH. We analysed the impacts of changes in wildfire activity and climate state on fire emissions heights, as well as the impact of changes in fire emissions heights on the wildfire climate impact.