Rewritten first paragraphs of introduction

The atmospheric boundary layer (ABL) dynamics and their impact on atmospheric chemistry are studied by combining field observations, taken during the HUMPPA-COPEC-2010 campaign (Williams et al., 2011), with a modelling study. HUMPPA-COPEC-2010 took place in the boreal forest. This ecosystem, located roughly between 50º and 65º N, covers 8 % of the global land surface and 27 % of the forested area, extending over 15×10^6 km^2 (Williams et al., 2011). Therefore, its impact on the global atmospheric chemistry and physics is significant. Since it contains over 10 % of the total carbon present in the combined ecosystems on Earth, perturbations in the climate of the Northern Hemisphere could lead to changes in the carbon cycle (including emissions of volatile organic compounds, VOCs) and aerosol formation and consequently alter the atmospheric composition (Sellers et al., 1997). Considering the large extent of the boreal forest, perturbations in this ecosystem may alter the dynamics and chemistry at different temporal and spatial scales, possibly up to the entire globe. Therefore, it is relevant and timely to study the atmospheric processes over the boreal forest at a range of scales in order to understand the interactions between the dynamics and chemistry. Here, we largely focus on the processes occurring at smaller spatial scales, which are influenced by the diurnal variability of the ABL.

During the HUMPPA-COPEC-2010 campaign, which took place at the Finnish SMEAR II station from 12 July to 12 August 2010, special emphasis was placed on obtaining a complete data set of surface and atmospheric measurements to comprehensively characterize the atmospheric physics and chemistry. Guided and constrained by this data, we focus on the influence of large scale forcings and transitions in the morning from nocturnal to daytime conditions on the boreal atmospheric boundary layer dynamics and the associated atmospheric chemistry. Our research extends on the analyses of previous campaigns, like the Boreal Ecosystem Atmosphere Study (BOREAS) (Sellers et al., 1997). BOREAS was conducted in the Canadian forest, aimed at improving the understanding of interactions between the boreal forest biome and the lower atmosphere (Sellers et al., 1997). Observations included dynamical, ecological and biogeochemical variables. The latter included observations of the trace gases CO_2, CH_4 and non-methane hydrocarbons. Even though the boundary layer dynamics were analysed (Barr and Betts, 1997; Davis et al., 1997), their evolution was not represented using models to identify and quantify the driving processes. In addition, their impact on the atmospheric chemistry was not considered.