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Modelling and assessment of particulate matter at rural background stations in Europe

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Air pollution due to particulate matter (PM) was investigated at rural background mountain, elevated and surface stations in Europe during 2011. Seasonality of the PM observations at mountain sites was analysed and compared to elevated and surface stations for the whole year in order to identify the regional variability and differences across Europe. Two different regional chemistry models were applied to analyse the trans-boundary transport of aerosols and the effect at background stations. The EMEP chemical transport model was run during October and November as well as the "online" meteorological and chemical transport model WRF-Chem, with different boundary layer schemes on different horizontal resolutions. Various tests were made with the implementation of the new, improved mixing length applicable for stable atmospheric (SA) conditions and vertical diffusion schemes in MYJ PBL scheme. Special attention was given to the regional characteristics of PM in Central and South - Eastern Europe during episode of observed high daily PM concentrations at background mountain stations which occurred during SA conditions. The accumulation of pollutants was governed by the large scale anticyclone conditions that prevailed over the Eastern and Central Europe enabling SA conditions characterized with low dispersion and mixing. Statistical analysis overview showed very scattered discrepancies between modeled concentrations and measurements. Both models underestimated PM concentrations at mountain stations during the episode indicating problems with regional transport of air pollution in SA conditions. EMEP model showed better agreements with measurements from the mountain and the elevated stations and it tends to produce the higher concentrations contrary to WRF-Chem which overall showed lower performance. The model inter-comparison showed large discrepancies in spatial distribution of daily averaged PM concentrations; however both models properly estimated gradual day to day increase of the surface PM concentration.