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Atmospheric implications of Indonesian peat fires

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Fires in Indonesian peatlands due to escalating land conversion activities have become an increasingly important factor influencing air quality and human health in Southeast Asia over the last decades. In extreme fire years, the emissions may strongly influence the global budgets of carbon and various trace substances in the atmosphere on the global scale.

An emission inventory including surface vegetation and peat fires in Indonesia has been developed for the period 1960 to 2000 by combining remotely sensed fire counts with land cover and soil maps, climatic factors, and empirical factors on burning and emission characteristics. According to this inventory, the 1997 fires in Indonesia emitted around 1136 Tg Carbon (C), making up 45 % to the global fire emissions in this year while it is on average less than 65 Tg C in non- El Niño years. Due to the high biomass density of peat, peat fires produce the majority of all the emissions. The inventory has been incorporated into the global RETRO emission inventory (REanalysis of the TROpospheric chemical composition over the past 40 years), and it has been used to assess the interannual variability of the impact of fire emissions on the atmospheric composition in the RETRO long-term model simulations.

Using a regional atmosphere-chemistry model (REMOTE), we investigated the atmospheric dispersion and impacts of the aerosols from the 1997 fires in Indonesia throughout the Southeast Asian region. The model results are used to provide an estimate of air pollution related mortality and morbidity in the region. During the 1997 smoke episode more than 200 million people were exposed to excessive fire-related PM10-pollution, and the number of premature mortality cases for Indonesia and parts of Malaysia is estimated to be above 30,000, which is about 10 times more than the commonly reported 3,000 – 4,000 excess deaths attributed to the London fog episode

in 1952. Compared to normal years with similar fire emissions, El Niño conditions as in 1997 strongly reduce the removal rate of particles by wet deposition and favour the northward cross-equatorial transport of fire emissions. The study also illustrates the dominant role of peat fire emissions in creating severe transboundary air pollution episodes. During El Niño years, the risk of large-scale, sustained peat fires is much higher because the areas in Sumatra and Kalimantan that experience abnormal dryness contain exceptionally large portions of peat soil. Prevention of fires in peat areas, particularly during El Niño years, is therefore of major importance to the mitigation of adverse impacts from Indonesian fire emissions.