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iLEAPS, the Integrated Land Ecosystem- Atmosphere Processes Study

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Recent progress in global change research has shown clearly that the Earth's environment is a complex dynamic system, defined through intricately linked processes, feedbacks and teleconnections. Transport and transformation of energy and matter across the land-atmosphere interface play a major role in controlling atmospheric composition, and affect climate, land cover and human health. To reflect a new integrated approach to Earth System Science, the international multi- and cross-disciplinary project "Integrated Land Ecosystem - Atmosphere Processes Study" (iLEAPS; http://www.atm.helsinki.fi/ILEAPS/) has been designed to study the interactions between land and atmosphere within the framework of the second phase of International Geosphere - Biosphere Programme (IGBP).

The fundamental objective of iLEAPS is to provide understanding of how interacting physical, chemical, and biological processes transport and transform energy and matter through the land-atmosphere interface, particularly emphasizing interactions and feedbacks at all scales - from past to future and from cell level to global scale. This includes scientific questions, such as what are the implications for the dynamics of the Earth System, how did the terrestrial-ecosystem/atmosphere system function under pre-industrial conditions and how are human activities influencing it, and to what extent does the vegetation determine its physical and chemical environment on various temporal and spatial scales. The research planned for iLEAPS covers the basic processes that link surface-atmosphere exchange with vegetation/ecosystem processes on the one hand and with atmospheric dynamics, tropospheric chemistry and physical climate on the other.

The research program is illustrated by four foci: 1) Land-atmosphere exchange of reac-

tive and conservative compounds: Key interactions and feedbacks in the Earth System, 2) Feedbacks between land biota, aerosols and atmospheric composition in the climate system (Biosphere-aerosol-cloud-climate interactions, Surface-atmosphere exchanges and the self-cleansing mechanism of the atmosphere), 3) Feedbacks and teleconnections in the land surface-vegetation-water-atmosphere-system, 4) Transfer of material and energy in the soil/canopy/boundary-layer system: Measurements and modelling.