*Session E: Novel Applications of Remote Sensing Technology to Environmental Well-Being*

**Technical Subject:**

# New Tools and Methods for Monitoring Photosynthetically Active Radiation and its Role in Crop Production and the Terrestrial Carbon Cycle

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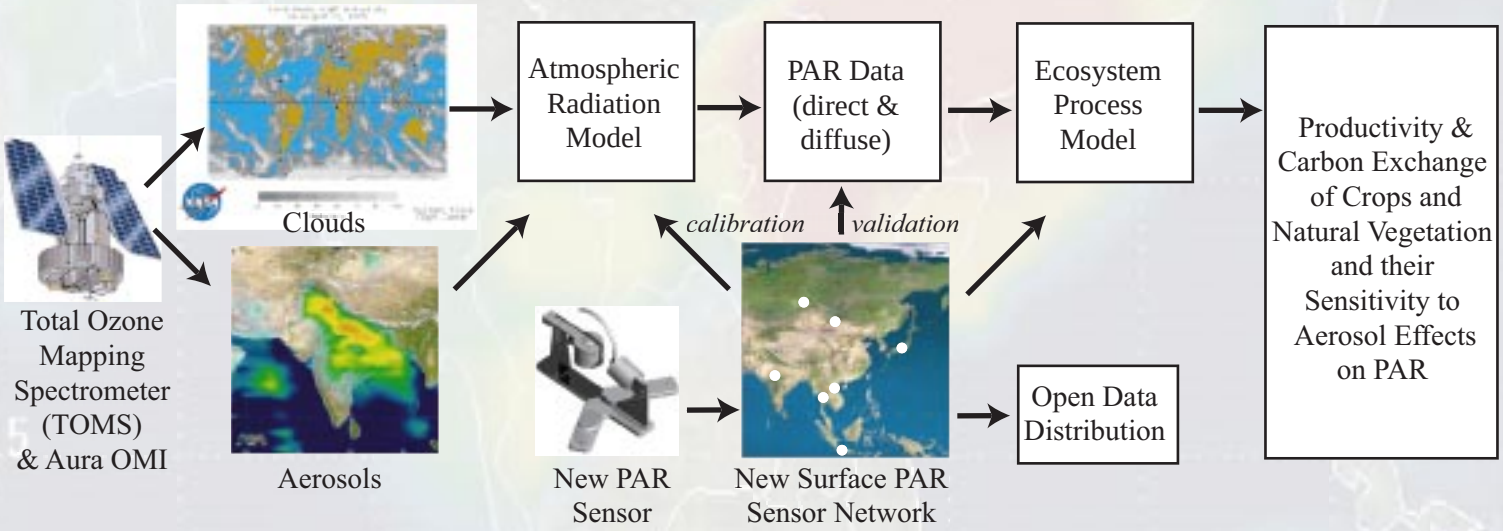


**Objective & Contribution to Environmental Well-Being**

Our research will introduce new tools and methods to advance current knowledge and understanding of how changing atmospheric conditions affect ecosystem functioning at regional and global scales. Of key importance to human societies is the potential influence of increased aerosols and/or cloudiness on photosynthesis, crop yields and the terrestrial carbon cycle. For example, recent research suggests that extensive aerosols from industrial air pollution may significantly reduce annual crop yields in China as a result of increased optical depths and decreased solar radiation at the surface. Current understanding of this phenemonenon is poor. Our research will provide the tools, data, and understanding, that are critically needed to guide strategies for mitigation of (or adaptation to) this source of global environmental change.

**Data & Methods**

We will develop a new remote sensing method that combines data on global aerosol and cloud properties from the Total Ozone Mapping Spectrometer (TOMS) (and future OMI sensor) with an atmospheric radiation transfer model to estimate direct and diffuse PAR irradiance. Surface measurement data for direct and diffuse PAR are crucial for PAR model calibration and accuracy assessment, however such data are extremely rare. To provide suitable surface PAR data, we will establish a new network of PAR measurement sites throughout the Asia region (Japan, India, Vietnam, Thailand, Mongolia, Thailand, Indonesia, and Russia). The satellite and surface PAR data will be used to drive an ecosystem process model and quantify the effects of PAR variability (attributed to aerosols and clouds) on photosynthesis and carbon exchange in natural vegetation and crops.

**Expected Results and Benefits**

The research will: 1) promote the commercial development of a new type of sensor for in situ measurement of direct and diffuse PAR, 2) establish an Asian PAR sensor network for validation and detailed studies of atmosphere-PAR-ecosystem interactions, 3) provide a valuable global data source on direct and diffuse PAR to support ecosystem process modeling, and 4) provide new understanding of the effects of aerosols and clouds on vegetation productivity and the terrestrial carbon cycle. Because the new PAR sensor has not previously been available, it will provide new opportunities for marketing and sales to researchers worldwide. The data and findings from the research will be made available to the research community and general public through the project website, existing data archives, conference presentations, and publications in international peer-reviewed journals.

**Opportunities for Collaboration**

We welcome discussion on possible collaboration with researchers with relevant interests and expertise.