

## Quantifying the Spatial Variability of Surface Fluxes Using Data from the 2002 International H<sub>2</sub>O Project

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**Abstract** Spatial variability in the exchange of energy and moisture is a key control on numerous atmospheric, hydrologic, and environmental processes. Using observations made on fair weather days during the 2002 International H<sub>2</sub>O Project, four methods for quantifying the spatial variability of surface fluxes are investigated. The first two methods utilize applied statistical techniques to describe the spatial variability of the surface fluxes, while the third method is a geostatistical technique rooted in variography. Typically, the methods yield similar results, with median values of horizontal variability consistent to within 5%. The geostatistical technique, however, provides much more information than the other statistical methods; it not only provides an estimate of the spatial variability, but also provides estimates of the total variability, the non-spatial variability due to measurement error, and the range of spatial correlation among the data points. The fourth method is based on the relationship between the components of the surface energy budget. This method describes the variability in the fluxes in terms of the slope of the best-fit line relating the time-averaged latent and sensible heat fluxes from different locations along the flight path. The meaning of the slopes can also be interpreted in terms of the spatial variability in the available energy. For four of the five days analyzed, the key control on the spatial variability in the turbulent heat fluxes was horizontal variability in the soil heat flux. In turn, the soil heat flux varied as a function of surface properties including surface temperature, soil moisture content, and leaf area index. On the remaining day, 25 May, the primary control was the variability in net radiation.

**Keywords** Airborne observations · IHOP\_2002 · International H<sub>2</sub>O Project 2002 · Spatial variability · Surface energy fluxes

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