Verification of Satellite Radar Remote Sensing Based Estimates of Boreal and Subalpine Growing Seasons using an Ecosystem Process Model and Surface Biophysical Measurement Network Information.

J. S. Kimball (1), K. C. McDonald (2), and R. Zimmermann (3)

(1) University of Montana School of Forestry, Missoula, Montana

(2) Jet Propulsion Laboratory, California Institute of Technology, Pasadena, California

(3) Max Planck Institute for Biogeochemistry, Jena, Germanmy

We employ daily surface Radar backscatter data from the SeaWinds Ku-band Scatterometer onboard Quikscat to estimate landscape freeze-thaw state and associated length of the seasonal non-frozen period as a surrogate for determining the annual growing season across boreal and subalpine regions of North America for 2000 and 2001. We compare this surrogate with estimates of growing season length derived from a network of surface stations, utilizing BIOME-BGC stand-level ecosystem process model simulations, site sap flow measurements, and tower eddy flux net CO2 exchange measurements for a network of mature evergreen coniferous forest stands. Remote sensing based estimates of spatial patterns in the timing of seasonal freeze/thaw vary by more than 8 weeks, while associated estimates of growing season length span more than 14 weeks across the region. Inter-annual variability between 2000 and 2001 is found to be on the order of 1-4 weeks. Remote sensing estimates of growing season initiation and length are found to be well correlated with both site measurements and model simulations. Remote sensing measurements of the end of the seasonal non-frozen period are also found to be consistent with site based temperature measurements, but not with site based estimates of growing season termination. These findings are attributed to a relatively strong dependence of the onset of the growing season to snowmelt and associated soil thaw in spring and the relative importance of additional factors such as light availability and day length in controlling growing season termination.

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