



## **Multi-sensor satellite observations of growing season initiation as related to snowmelt and spring thaw in Siberia**

**T. Le Toan** (1), N. Delbart(1), M. Grippa(1), S. Vicente-Serrano(1), L. Kergoat(1), N. Mognard(2), R. Kidd(3), W. Wagner(3)

(1) Centre d'Etudes Spatiales de la Biosphère, Toulouse, France  
(Thuy.Letoan@cesbio.cnrs.fr), (2) LEGOS, Toulouse, France, (3) IPF, Vienna, Austria

Recent observations suggest changes in the seasonal cycle of atmospheric CO<sub>2</sub> at high northern latitudes attributed to earlier ecosystem carbon uptake and increased NPP associated with warmer spring air temperatures, earlier thawing and longer growing seasons. This greening trend is suggested to be tightly linked to changes in land surface temperature during the past decades.

Seasonal cycles of forests at high latitudes and elevations are characterized by alternating periods of active growth and winter dormancy, where the growing season defines the potential period for growth, assimilation and storage of atmospheric CO<sub>2</sub> by vegetation. Initiation of the growing season for boreal forests coincides with a relatively abrupt, seasonal switch from a net source to sink for atmospheric carbon. In boreal region, growing season initiation usually associated with snowmelt and thawing of upper soil horizons in spring. Current knowledge of interannual variability in the timing of boreal spring thaw, in particular, is of the order of 6-7 weeks, with significant impacts on forest annual NPP and corresponding feedbacks to regional and global carbon cycles. In this paper, we will use Earth Observation data from different satellites to observe greening, snow melt and thawing dates in Central Siberia. The objective is to examine the time lags between the thawing, snow melt and greening dates to understand the mechanisms that govern the growing season initiation. Greening dates are detected using SPOT/VEGETATION data, snow melt dates are derived from SSM/I data and thawing dates are from QUIKSCAT data. There is a good correlation between greening dates and snow melt dates, with mean greening dates lag behind

the snowmelt dates of about 6 to 10 days. The time lag is the smallest for deciduous species, including larch, and the longest is for tundra and dark coniferous (cedar, fir). The relationship between snow melt and thaw dates are less clear. Snow melt occurs well after the thaw dates and the time lag is of the order of 40 days. The relations between the budburst dates and the onset of thaw, where time lag is of the order of 40-50 days, indicating that the growing season initiates well after the soil thawing, for all species. It means that in Siberia, the growing season initiates shortly after snow melt, and the soil thawing is not a switch-on signal. To confirm this result, other sources of data are needed. Those include e.g. tower eddy-flux CO<sub>2</sub> measurements.