Geophysical Research Abstracts,
Vol. 10, EGU2008-A-00891, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-00891
EGU General Assembly 2008
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A simple model to map the snow cover under clouds using optical remote sensing data

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In many alpine regions, snowmelt plays a key role in regional hydrology. The areal extent of the seasonal snow cover is a principal input variable for operational snowmelt runoff modeling, such as Snowmelt Runoff Model (SRM), which uses the snow cover information derived from remote sensing as input. For the simulation requirement for higher temporal and spatial resolution at the watershed scale, the snow cover distribution map is mainly derived from optical remote sensing data at present. But the optical remote sensing images are often severely contaminated by cloud, which leads to the lack of snow distribution information and the inaccuracy of snow cover depletion curve. This study describes a simple and innovative methodology to remove cloud contaminations and produce cloud-free snow cover map automatically using the time series of high temporal resolution optical remote sensing images (e.g. MODIS or NOAA AVHRR), digital elevation model (DEM) and meteorological data. This approach is based on snow cover change trajectory analysis and snow-terrain relationship analysis.