Toward a Consistent Land Long Term Climate Data Records from Large Field of View Polar Orbiting Earth Observation Satellites

*Eric Vermote[1], Jean-Claude Roger[1,2], Belen Franch[1,2], Christopher Justice[2], Ivan Csiszar[3], Sadashiva Devadiga[1], Edward Masuoka[1]

1. NASA Goddard Space Flight Center, 2. University of Maryland, Dept. of Geographical Sciences, 3. NOAA/NESDIS/STAR

Surface reflectance is one of the key products used in developing several higher-order land products, such as Vegetation Indices, Albedo and LAI/FPAR, it is therefore seminal to detecting trends in the biosphere and land surface and has been classed by NOAA as a "Fundamental Climate Data Record (FDCR) for Land". Building a long-term surface reflectance data record of climate quality implies combining different instruments, sensors and satellites, accounting for different spatial resolutions and spectral characteristics, assuring consistent calibration, and correcting for atmospheric and directional effects. As the spatial resolution issue is addressed by aggregating the original data to a resolution still suitable for climate studies (e.g. 0.05 degree latitude, longitude), the instrument calibration becomes the first major hurdle one has to go through before being able to proceed any further.

In this work, we are using robust reflectance data records and inter-comparison methods that we have developed over the past several years (consisting of atmospheric correction, directional effect correction and spectral normalization) to establish and verify the inter-consistency of the reflectance products from the AVHRR sensors on-board NOAA 7, 9, 11, 14, 16, 17 and 18, the MODIS sensors on-board Aqua and Terra and the VIIRS sensors on-board Suomi-NPP and JPSS1. The resulting dataset being the 35+ years surface reflectance product and vegetation indices from 1981 to present.

Several other calibration techniques are also be applied that have been developed in the past by our team, in particular combining the cloud spectral band inter-calibration with BELMANIP cross sensor calibration in the near-infrared, using Landsat 5, 7 and 8 calibration to bridge between AVHRR and MODIS.

Keywords: surface reflectance, land climate data record, earth observations satellites