Geophysical Research Abstracts
Vol. 14, EGU2012-9274, 2012
EGU General Assembly 2012

Phenological monitoring of vine using MODIS imagery in the vineyard of Saumur-Angers (Loire Valley area, France)

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The present study focuses on the phenological monitoring of vine with MODIS multitemporal data. It takes part of two programs which deal with global change and agricultural adaptations: TERADCLIM (2011-2013) for wine makers and CLIMASTER (2008-2011) about agricultural resources in four administrative regions of Western France. Numerous studies use very high resolution remotely sensed data to monitor vineyard, despite their low acquisition frequency. Here we investigate the potential of images with moderate resolution (250-500m) but high temporal resolution to detect changes in phenology of vine. The investigated area, called the AOC (Appellation d'Origine Contrôlée) vineyard of Anjou-Saumur - AOC-SA (47°13'N-0°26'E), covers an area of 33,840 hectares and is located in West-Central France. In this monoculture area, the observed changes in biophysical variables strongly depend on temperature and precipitation variability, and, thus, represent an interesting opportunity to study relationships between climate change and evolution of vine phenology. We use a MODIS images dataset from 2000 to 2011 with a temporal resolution of one image every 10 days. Our workflow builds regular series of reflectance images from which biophysic variables (like fCOVER, vegetation cover fraction) are calculated. Thanks to the TERVICLIM (ANR-JC 07-194103) program, 13 weather stations were set up within the AOC-SA, between 2008 and 2011. The average climatic data (temperature, rainfall) from this network are linked to Modis data. The monthly records of the biophysical variables over the studied period clearly show annual oscillations including a seasonal and monthly variability of the fCOVER associated with climatic features. Furthermore, the remarkably mild and wet winters of 2000-2001 and 2006-2007 were favourable to an increase of photosynthetic activity and vegetation coverage ratio. The strong and long-term rainfall deficit (until autumn) in 2005 and the associated hydric stress involved a strong decrease of photosynthetic activity and vegetation coverage ratio. These preliminary results show that Modis images can be useful for vineyard monitoring at site-scale. Future works will focus on their ability to detect different phenological stages at finer scale.