Challenges of Remote Sensing Data in Models for Assessing Climate Impacts on Agriculture

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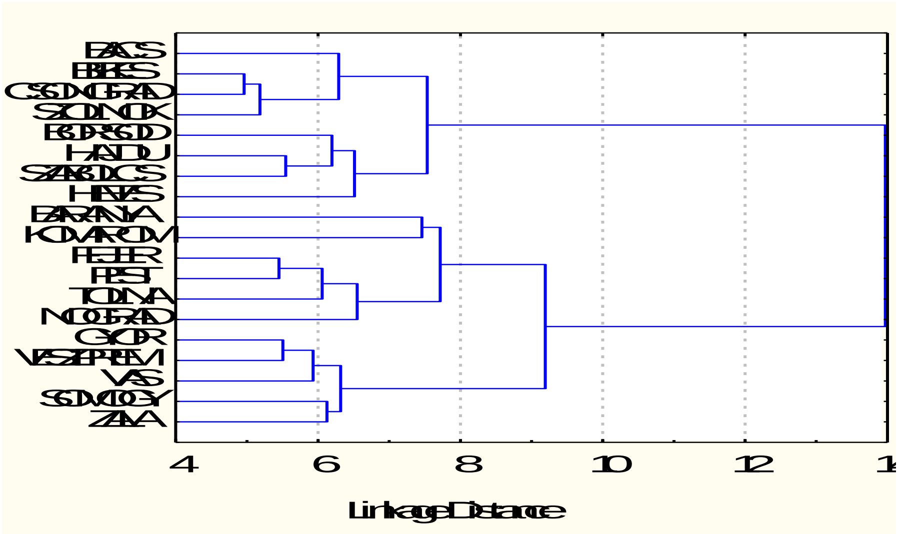
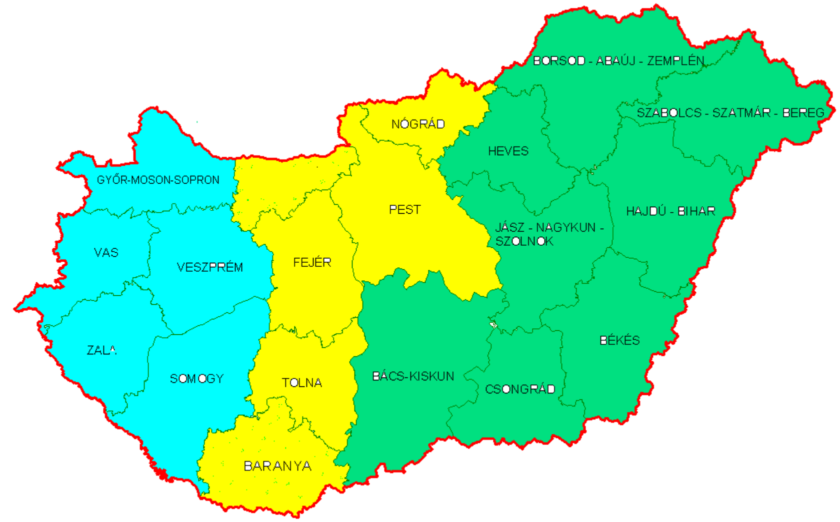
WG 2.1 Results (1) : *Status of satellite data for warning purposes for agriculture, in Europe*

- Among European countries there is a great inhomogeneity concerning climate and biophysical data received from satellite sensors or collected as satellite-derived ready products;
- Main variables collected are **Land Surface Temperature** and **NDVI;**
- In a second series of the climate variables are: cloud products, snow cover, radiation, land cover, precipitation, evapotranspiration and albedo;
- Variables collected only in specific cases: Air-stability, Storm detection, Ozone content, VCI, TCI, Soil moisture, MSAVI, LAI, Degree days, sea ice and sea wind;
- **SEVIRI/METEOSAT and AVHRR/NOAA** are the most popular sensors;
- **MODIS and ASTER** are preferred due to easy accessibility via internet and because their improved spatial, temporal and spectral characteristics;

- Most countries have their own satellite reception systems.
- There are differences between countries regarding the use of climate and biophysical variables, explained by the fact that the high level products (like evaporation, soil moisture, storm detection, etc) require quite **complex algorithms or schemes**;
- Among the limitations to use satellite data are:
  - the need to manage extremely large volumes of data;
  - restrictions of spatial sampling, resolution and temporal sampling;
  - accounting for orbit drift and sensor degradation over time;
  - difficulty of calibrating after launch (e.g., vicarious or onboard calibration);
  - the need for significant computational resources for reprocessing.





Results of cluster analysis to determine vegetation regions in Hungary according to NDVI. The left image indicates the clustering process with the short names of the administrative counties in he order of their amalgamation. The right image indicates the 3 regions for which a stable linkage distance can be obtained. Vegetation fluctuates similarly within the regions and differently from the other ones.

WG 2.1 Results (2) : ***Potential for assimilation of satellite data into models***

- A large variety of information is freely available for the users who would like to study vegetation temporal and spatial changes over the last 10-30 years.
- Remotely sensed data have been shown to be a useful tool in the **assessment of stress caused by adverse climatic conditions and in crop yield modelling**.
- For the operational assimilation of satellite image data in crop models there are some new approaches for **data collection and analysis**. The most promising solution seems to be the **constellation of identical satellites in the same orbit**.
- Recent reviews regarding the **methods for retrieving biophysical properties** showed that most of radiative transfer inversion techniques are based on **iterative optimization or neural networks methods**. However, the inversion of radiative transfer models is a major problem which may induce significant uncertainties in the biophysical variables estimation when limited information is used.
- High level remote sensing products are easier to assimilate. Nevertheless, working with more ‘core’ satellite observations such as low level products can provide better results, since assumptions made in the satellite product calculation are avoided.
- The assimilation of ‘raw’ remote sensing data, although it can provide better results, is often an unrealistic approach due to the computing power required.
- There are probably enough platforms in space to collect daily 30m spatial resolution data for the whole of Europe. The **effects of cloud cover** need to be quantified and some areas of Europe may be too cloudy to allow weekly observations.