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Sentinel-1 SAR data for agricultural applications

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Statement of the Problem: Farmers who want to use precision farming technology need a navigation system and an on-board computer to apply fertilizers or other supplies, site specific. Moreover, they need a reliable source of actual and frequent geodata as reference for their management decision. In crop insurance schemes, the claims process is laborious and hence cost intensive. Repeatable results in loss estimation are hard to achieve. Remote sensing technology can help to identify areas within the plots with different gradual change before and after the event. This data can guide the loss adjuster to the relevant spots and later aggregate the loss ratio per area. For claims handling, it is crucial to have a reliable data supply to analyze the change caused by an event.

Appropriate Technology: Spaceborne SAR (synthetic aperture radar) data penetrates clouds and guarantees reliable data supply throughout the year. The repetition rate is worldwide 12 days/Europe six days. Sentinel-1 SAR data has a ground resolution of 20x20 m, which is suitable for cropland monitoring.

Significance: Sentinel-1 data delivers a C-band radar backscatter in two polarizations. The signal changes according to structure of the surface and humidity in the soil and plants. The two signals have to be transformed into a scale that indicates fresh biomass as proxy for decision making. Moreover, other information like phenological stage of cropland, growth dynamic or crop-type differentiation are valuable information for certain use cases and can be derived from SAR data.

Conclusion: Sentinel-1 SAR data can be transformed into map products for specific business processes in the field of precision farming and crop insurance. The same technology can be useful for crop monitoring in the field of disaster management and early warning systems.



Figure 1: Temporal and spatial analysis of a time-series in Brazil/Parana from ESVI (enhanced SAR vegetation index) and Landsat 8 NDVI

Biography

Dietrich Heintz worked in the past seven years in the field of Remote Sensing with spaceborne SAR data, precision farming and crop insurance. Until 2017, he was an employee of Allianz Re in Zurich where he was In-Charge for maintaining field-trials and reference data analysis to develop map products for crop insurance schemes and precision farming applications. In this time he worked in close cooperation with sarmap, which is a technical leader in SAR data processing and software development. He has worked in applied research institutes in the field of Agriculture and Forestry (1996–2008) as well as in the field of Environmental Monitoring, GIS and Remote Sensing with Optical Data. He passed a distance learning course at UNIGIS Salzburg (2001–2003). He is an experienced Organic Horticulturist in Vegetable Production (1983-1987) and has worked as an employee, first in a home for retarded children (Michaelshof in Hepsisau) and later in Zambia in a development aid project (1990-1994). There he introduced organic vegetable production, invented a scheme to fertilize with algas from a reservoir over the irrigation system and trained school-leavers.

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