SOACOM Project

The National Space Activities Commission (CONAE) promotes and implements all activities related to the spatial area in Argentina. The SOACOM Mission is an end-to-end Earth Observation System dedicated to remote sensing and data exploitation. It consists on a constellation of two L-band polarimetric Synthetic Aperture Radar (SAR) satellites, SOACOM 1A and SOACOM 1B.

Each satellite will provide global coverage and a repeat cycle of 16 days, with 8 days for the whole constellation. The two SOACOM satellites integrate the SASSGE constellation (Brazil-Argentina Satellite System for Emergency Management) implemented jointly by CONAE and the Italian Space Agency (ASI). Agenda Spatialis (France). This System consists of the Argentinean SAOCOM 1 constellation and the Italian COSMO-SkyMed constellation composed of four satellites carrying each one, an X-band SAR as a main payload.

One of the main drivers of the SOACOM mission is to develop soil moisture maps for giving support to agricultural, hydrological, health applications, and emergencies in general.

<table>
<thead>
<tr>
<th>Satellite</th>
<th>SOACOM 1A y 1B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode</td>
<td>StripMap, TopSAR</td>
</tr>
<tr>
<td>Ground Range Coverage</td>
<td>About 350 km</td>
</tr>
<tr>
<td>Spatial Resolution</td>
<td>From 10 to 100 m</td>
</tr>
</tbody>
</table>

The SOACOM satellites shall be injected in a sun synchronous, nearly circular frozen polar orbit (SSO), with Local Time Ascending Node (LTAN) in a range centered at 06:12 am and an orbit altitude of about 620 km.

The SAOCOM satellites shall be injected in a sun synchronous, nearly circular frozen polar orbit (SSO), with Local Time Ascending Node (LTAN) in a range centered at 06:12 am and an orbit altitude of about 620 km. The SAOCOM Mission is an end-to-end Earth Observation System dedicated to remote sensing and data exploitation. It consists on a constellation of two L-band polarimetric Synthetic Aperture Radar (SAR) satellites, SOACOM 1A and SAOCOM 1B.

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Example of SOACOM Applications and Products

Surface Soil Moisture Map

Bare Soil Inversion Method

In order to invert to the soil moisture model, the Look-Up Table model (LUT) will be used. The LUT model was applied to these data using relationships between the backscatter coefficient, soil moisture, incidence angle and different surface roughness cases were generated with a forward simulation of the soil moisture model. These relationships were consequently put in a look-up table, which could then be used to invert the backscatter coefficient to soil moisture.

The IBM and Dubois models work with the dielectric constant, therefore Topp model’s (Topp et. al. 1980) works was used to obtain soil moisture. A set of 30 look-up tables were generated for each incident angle (25-55 degrees), considering a radar configuration for L-Band (500 MHz). The soil moisture accounting in the soil, for assessing the rainfall-runoff transformation. Weather and long term probabilistic forecasts. Probabilistic forecast with the ESP technique consist in fitting a probability distribution function of the hydrologic variable under study for each future “instant”. For instance, the distributions may be fitted for each one of the twelve months (or 52 weeks, or 26 fortnights, etc.) subsequently to the elaboration of the forecast.

Study Area “Llanuras Pampeanas” (pink), and lakes, (light blue) “Ríos del interior” study

SOACOM Mission

The Sainte-Famille, Falda del Carmen. SARAT Pixel Image (pixel size=3x3)

Field experiments will be conducted in representative sites of the Argentinean Pampas and Basement. During the first growing season we are concentrating on one specific site where the complete list of variables will be measured. CONAE- Cordoba, Falda del Carmen.

During the second growing season, once all the information acquired in the first campaign would by then be analyzed, we will repeat the set of experiments on different sites encompassing contrasting environmental situations characterized of the Pampas region. Treatments is a factorial combination of i) different soil tillage methods: a) 4 crops (soybean, maize, soybean, and sunflower) ii) soil irrigations (no irrigation, irrigated) and iii) canopy irrigations (no irrigation, irrigation). Each treatment will be established in 50 x 50 m plots with a separation of at least 10 meters in between.

SOACOM Mission

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Regions of Interest

The Argentinian Pampas, covers different combinations of soil, weather and environmental conditions. If land surface is homogeneous regional parameterization can be used (Topp et al., 1980). Conversely, for common heterogeneous land surfaces this condition is difficult to satisfy (Hu & Islam, 1997).

The climate is warm with adequate to less than adequate rainfall for normal crop production. The climate is primarily affected by two regions: the North and the South of the Pampas respectively. In part of these regions, the temperature and the frost-free period are adequate for growing double crops (i.e. soybean or maize planted after wheat). Rainfall amounts show high inter-annual variability. Most rainfall occurs between October and April (spring to fall seasons), and the long term annual average is 550 and 1035 mm in the South West and in the North East regions, respectively.

Most of the region was originally covered by grasslands, interrupted only by gallery forests. In terms of the areas cultivated, the main crops are soybean, wheat, maize and sunflower, in that order. Secondary crops are sorghum, barley, groundnuts and flax.