From science to industry, technology transference with CubeSats

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IACTEC Space

The Instituto de Astrofísica de Canarias (IAC) has as main objective to promote and carry out all types of research in astrophysics and its related fields. This mission means that the IAC has been involved in instrumental developments for both ground-based and space observations for decades. This accumulated experience led the IAC to launch an innovative initiative, ***IACTEC***, a technological and business collaboration space set up by the Instituto de Astrofísica de Canarias (IAC), whose mission is to develop in the Canary Islands an innovative ecosystem for the transfer of high technology between the public sector and companies, taking advantage of the scientific and technological capital of the IAC.

Within this initiative, ***IACTEC-Space*** focuses on innovation and development related to the payload of small satellites and remote sensing. Here we present the first ***IACTEC-Space*** project, the *DRAGO* instrument, one of the first SWIR cameras on board in a CubeSat, *ALISIO-I*. *DRAGO-ALISIO* will be launched on 2021 with the aim of studying urgent issues for the Canary Islands, such as fire controls, deforestation and water pollution, but also to train a multidisciplinary team in the design, development and integration process of payloads for satellites.

IACTec Space Team
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1. Context

IACTEC

The IAC must capitalize its know-how and make use of its exclusive position in the scientific community to offer <u>two key products</u> to other institutions and companies interested in developing research space projects:

- **Technology**: payloads, transmission systems, image processing, etc
- **Services**: allocation of payloads, space systems testing, test-benching, etc

ROADMAP

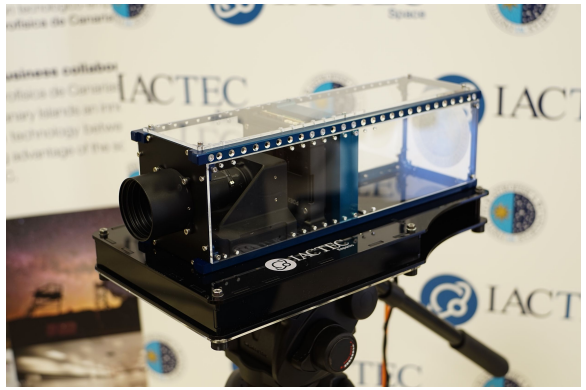
- Multidisciplinary engineering team oriented towards instrumentation and remote sensing
- Generate business network on the Space Sector in the Canary Islands
- Boost private-public collaborations and initiatives in innovative technologies
- Open new lines of research in EO and astrophysics
- Launch the first Canarian EO nano-satellite
- Make the Canary Islands a reference point in the development of nano, micro and mini-satellites and HAPS

IACTEC HQ, Tenerife

2. Description of the project

ALISIO & DRAGO

Advanced Land Imaging Satellite for Infrared Observations



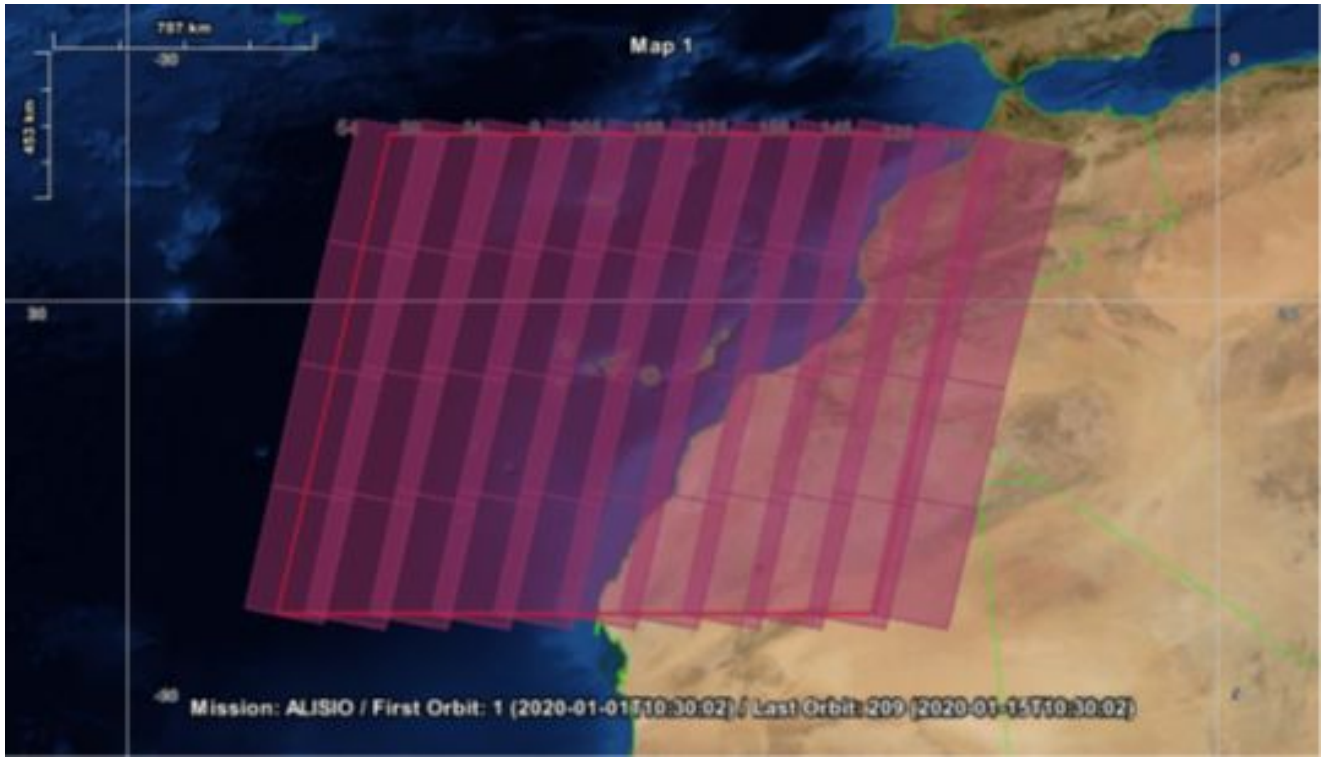
Orbit height range (km)	450-650
Swath @ 500 km (km)	190
Resolution @ 500 km (m)	250
Temperature range (ºC)	-10 to +70
Ionizing radiation tolerance (krad/year)	> 30
Fluence @ LET>10 MeV cm^2 mg^{-1}	< 10
Expected life (years)	> 3
Sensor technology	InGaAs
Observable bands (µm)	1.1 & 1.6
Frame rate (fps)	Up to 160
Signal to Noise Ratio	> 100
Mass (g)	1070
Power consumption (W)	4.7
Required Volume	1 U

Demonstrator for Remote Analysis of Ground Observations

3. Results I

- TECHNOLOGY VALIDATION:
  - DRAGO: Uncooled InGaAs detector
  - MELISA: AMR sensors to measure very low frequency magnetic fields

Mapping Canary Islands in SWIR



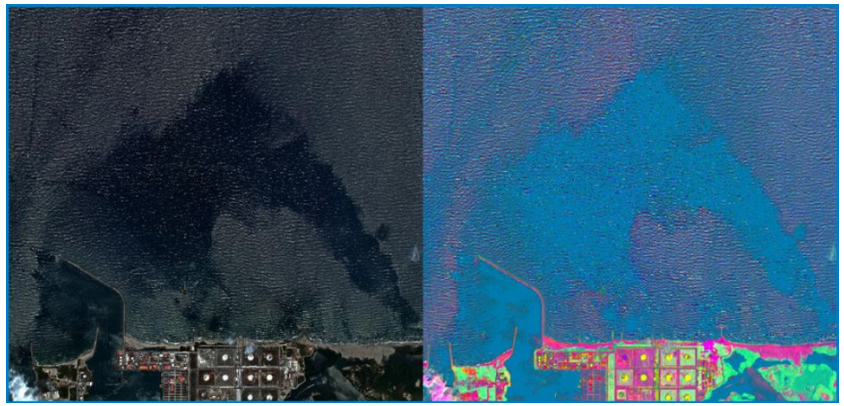
3. Results II

Imaging in SWIR

Wildfire detection and monitoring

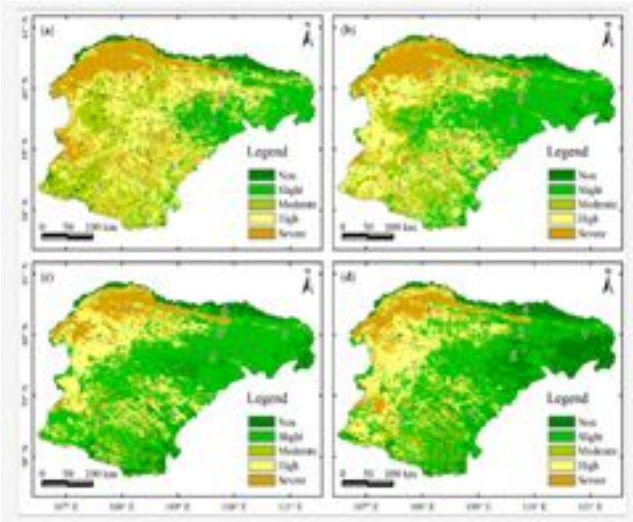
Visible (1) SWIR

Oil spills monitoring



Visible (1) SWIR

Desertification analysis



(2)

(1) "Short-wave Infrared Imagery (SWIR)", European Space Imaging, https://www.euspaceimaging.com/wp-content/uploads/2018/06/EUSI-SWIR.pdf

(2) **"Satellite Monitoring the Spatial-Temporal Dynamics of Desertification in Response to Climate Change and Human Activities across the Ordos Plateau, China", Qiang Guo 2017, https://doi.org/10.3390/rs9060525**

4. Future prospects

- Satellites:
  - ALISIO-II: VIS-NIR + SWIR
  - MiniSat: VIS+IR with <5m resolution
  - TeideSat: ESA FYS
- Earth Observation:
  - EO application using Copernicus images
  - AI + EO
  - New Space DDBB
- Astrophysics:
  - CubeSats for scientific missions
  - Multi-wavelength scientific instrumentation
  - Astrophysics image acquisition, processing and analysis
- Technology transfer:
  - Creation of local industrial fabric in space sector
    - CanarySPACE: SMEs ecosystem on EO apps
  - Establishment of collaboration networks at a local and international level
- **AND MORE! Contact us! (info.iactec@iac.es)**