



ESA's FLEX Data Innovation and Science Cluster (DISC)

J. Vicent on behalf of the FLEX DISC consortium





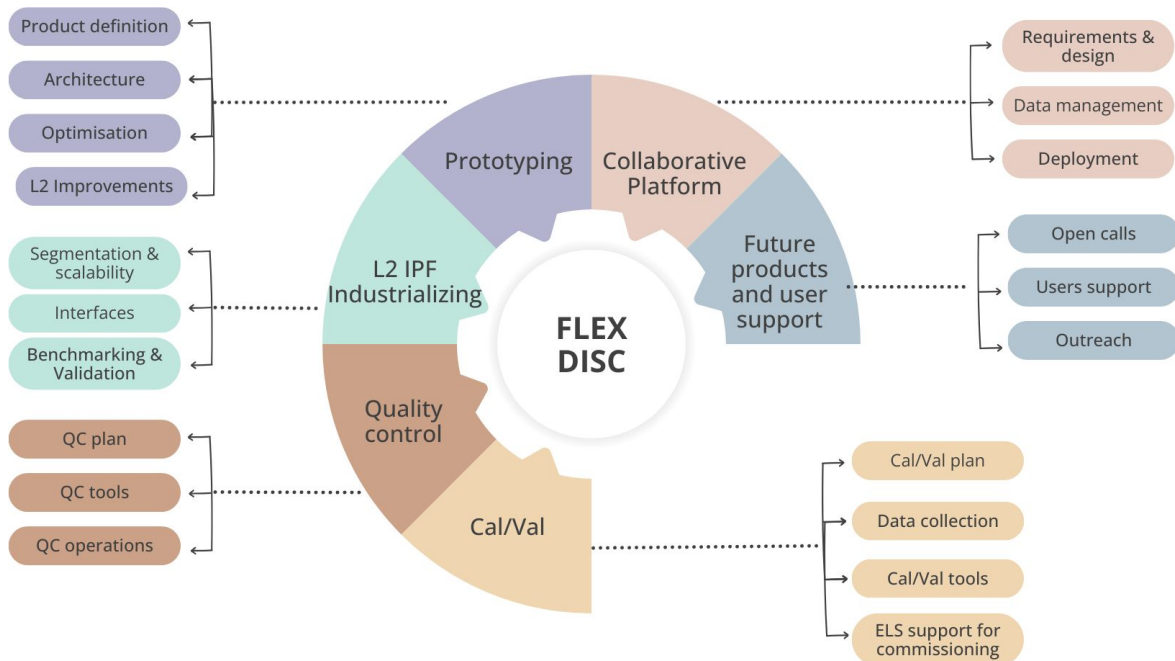
ESA's FLEX Data Innovation and Science Cluster (DISC)

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Goals: (1) to develop the FLEX Ground Segment ensuring efficient mission operations with the best data quality, and (2) to involve future FLEX data users.

Specifically, we want to:

1. Improve and industrialise the L2 processor into the **IPF**
2. Develop a **collaborative platform**
3. Implement **Cal/Val** activities for commissioning and operations
4. **Quality monitoring** of FLEX data
5. Enable **users** to contribute with state-of-the-art **algorithms**

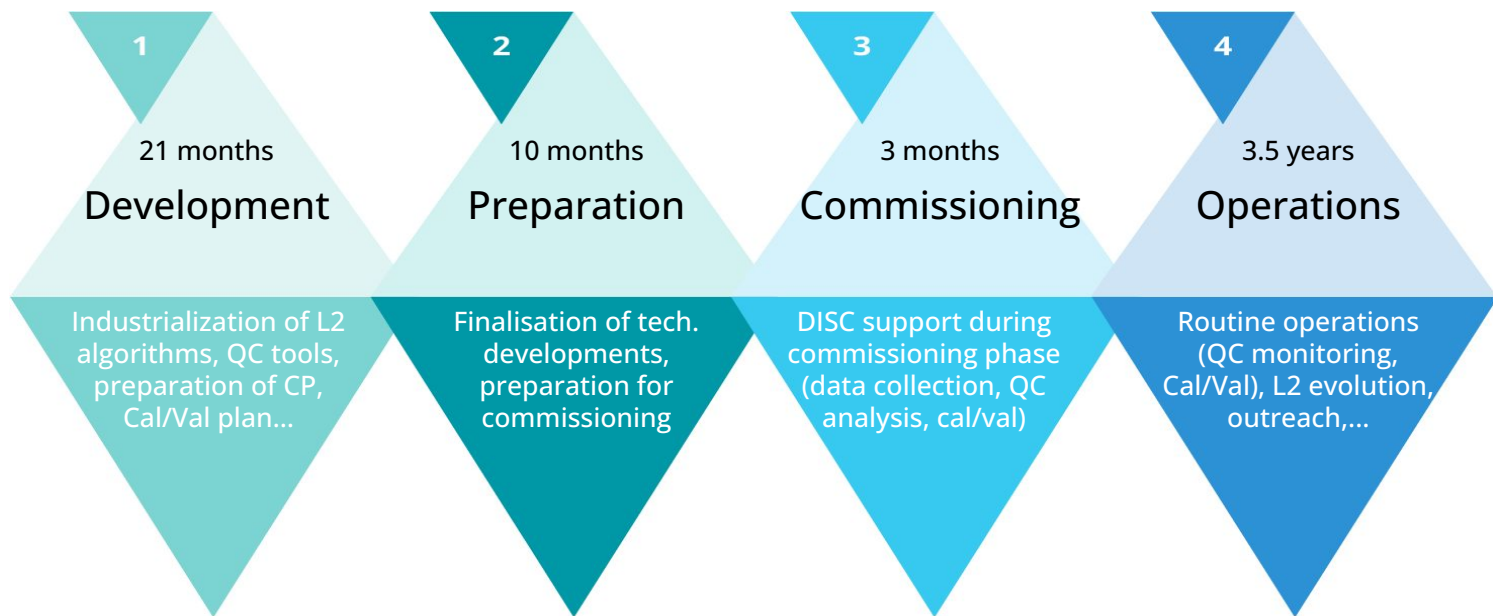




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4 phases, with a total duration of 6.5 years.

The DISC project enrols a large team of experts to perform the requested activities, from scientific institutions (algorithm development, validation, outreach) and industry (ground segment industrialization, collaborative platform, quality monitoring, operations).

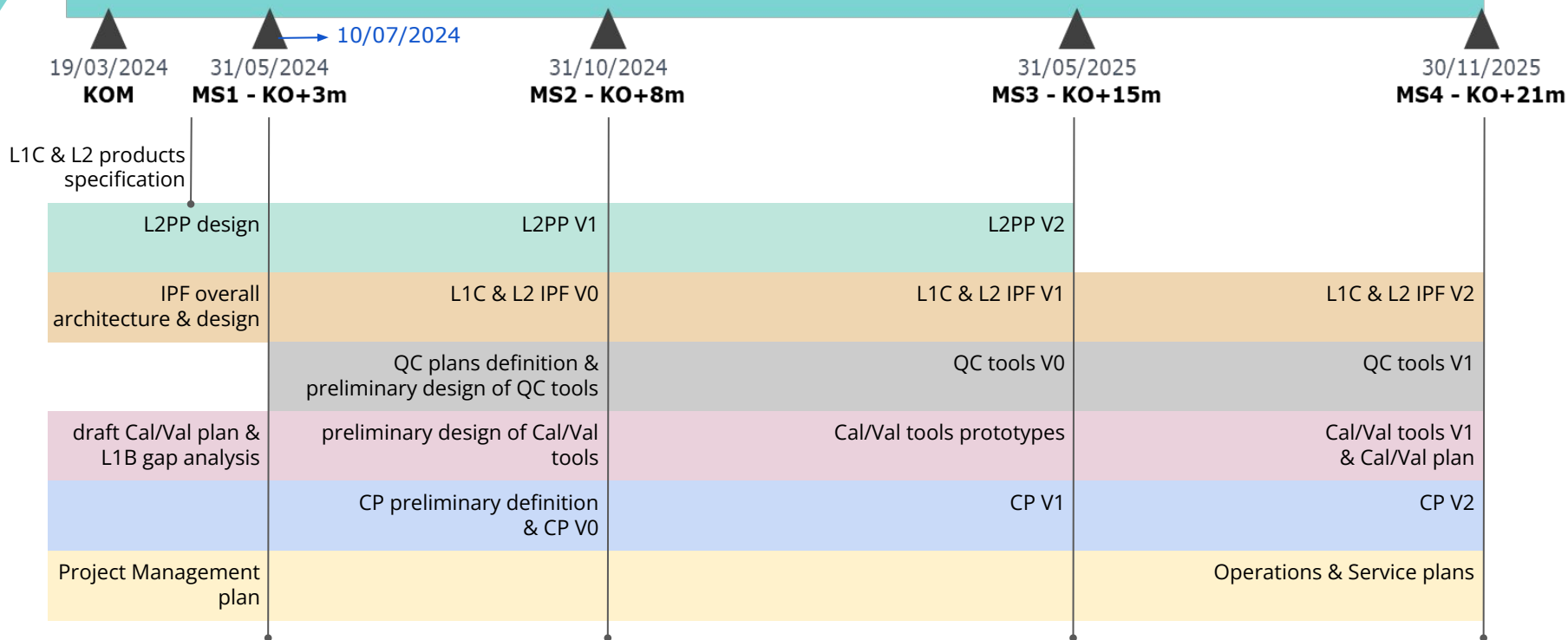




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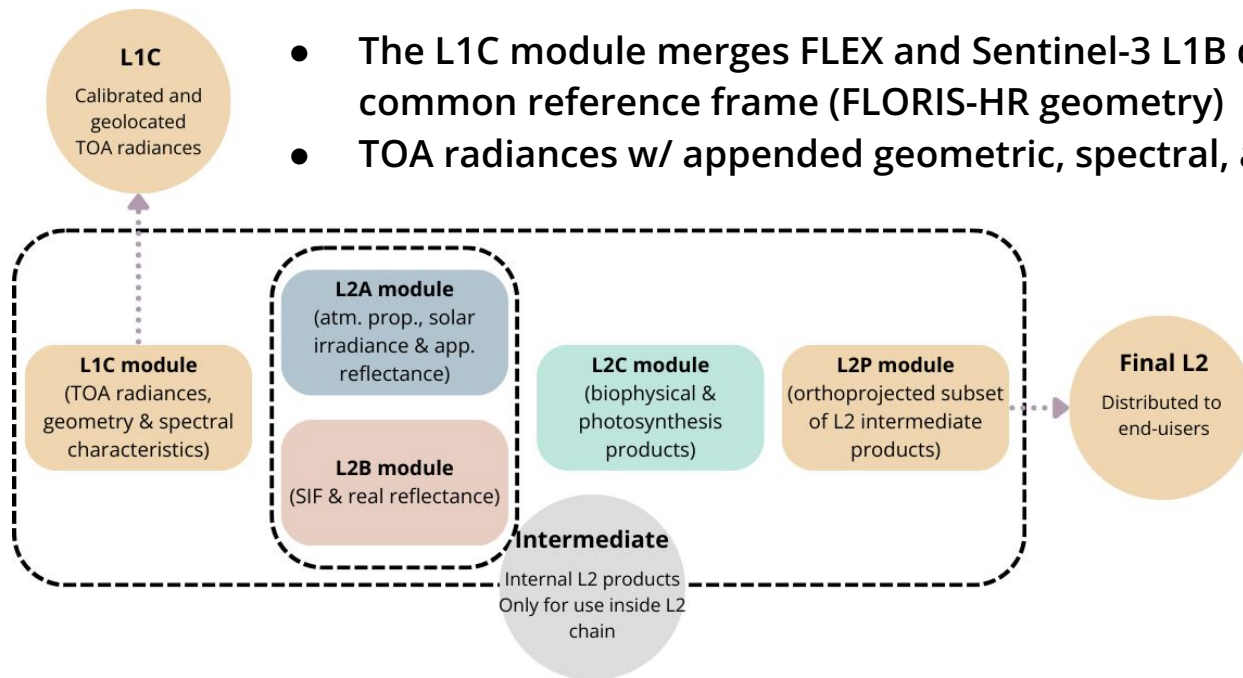
1. Development 01/03/2024 - 30/11/2025





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L1C/L2 data processing chain and products



L2 products (in UTM S2 tiling)

- Surface reflectance
- Atmospheric composition (H₂O, aerosols)
- At-surface irradiance
- SIF spectrum
- Biophysical parameters (LAI, LCC, LCCAR, fAPAR)
- Photosynthesis products (NPQ, APAR_ChI, FQE, ETR, fesc, PSI/PSII)
- Ancillary data

State-of-the-art algorithms process the input L1C product:
DVA+FLORIS refinement, OE for SIF retrieval, GPR for vegetation



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On-going cal/val activities

- Identification of cal/val sites
- Conception of validation protocols and algorithms
- Identification of necessary datasets
- Conception of of cal/val tools and testing data

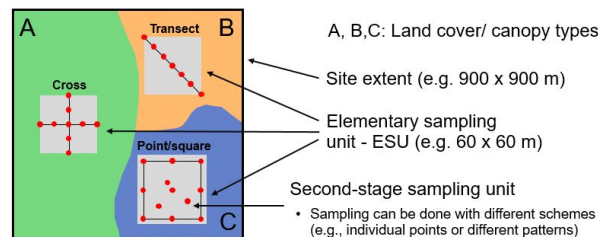


OPTIC

Spec1

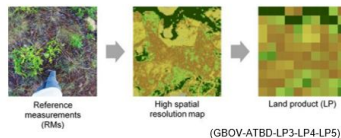
Spec2

Wavelength range	~ 650–800 nm;	~ 400–950 nm
Spectral Sampling Interval (SSI)	~ 0.17 nm	~ 0.65 nm
Spectral resolution (FWHM)	~ 0.3 nm	~ 1.5 nm
Signal to Noise Ratio (SNR)	~ 1000	~ 250
Field Of View (FOV)	Dual FOV. Upwelling radiance ~25°. Downwelling radiance 180°	



Adapted from Morissette et al., 2006 and Cochran, 1977

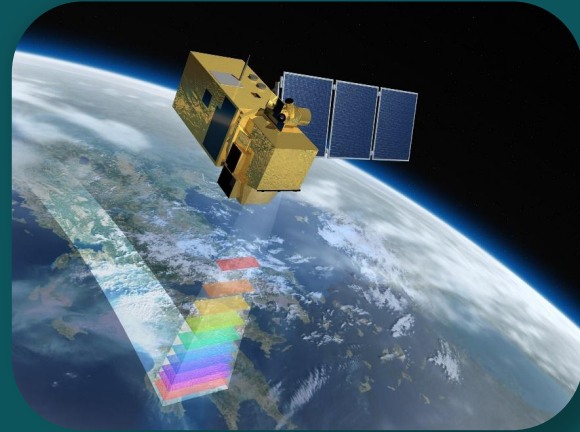
Two stage or bottom up approach



```
147 % creates the output header - L200 OUTPUTS -----
148
149 out_hdr = ['DOYdayfreq' 'UTC_datetime' 'filename' ...
150           'SIF_FARRED_max' 'SIF_FARRED_max_wl' 'SIF_RED_max' 'SIF_RED_max_wl' ...
151           'SIF_008' 'SIF_02A' 'SIF_int' 'SIF_028_um' 'SIF_02A_um' ...
152           ];
153
154 out_mat = nan(n_files,size(out_hdr,2)-12);
155
156 %%% PROCESSING -----
157
158 [fluo_SFM,ref_SFM,fluo_un_SFM,...
159  ref_un_SFM,fl_SFM,...
160  SIF_R_max,...
161  SIF_R_wl,...
162  SIF_028,...
163  SIF_FR_max,...
164  SIF_FR_wl,...
165  SIF_02A,...
166  SIF_int,...
167  SIF_02A_um,...
168  SIF_028_um] = FLEX_processing(wl_unc, L_down_unc, L_up_unc, Lin, Lup, ...
169                               owl, cov, DOYdayfreq, UTC_time, data_path, save_flag, plot_flag);
170
171 % rename and save spectra from SpecFit
172 outf_Specfit = fluo_SFM;
173 outr_Specfit = ref_SFM;
174
175 outSIF_FR_max = SIF_FR_max;
176 outSIF_FR_wl = SIF_FR_wl;
```



Thank you for your
attention.



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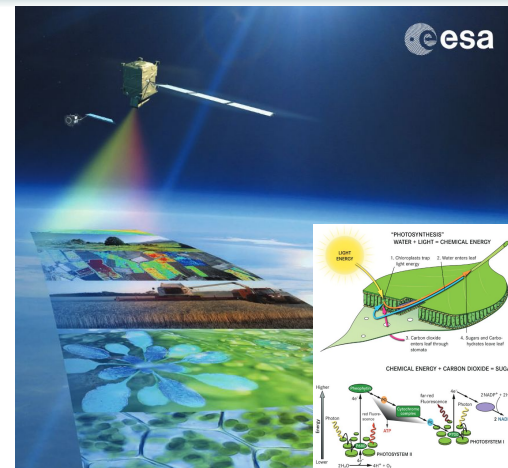
ESA's FLEX mission is designed to quantify the **photosynthetic activity** of terrestrial vegetation by characterising its full energy balance, for which **Sun-Induced Fluorescence** (SIF) emission is one of the key components.

This scientific mission has potential applications in stress detection, food security, and carbon cycle.

Several activities were carried out in the last years:

- development of L1B and L2 products,
- validation within an E2ES framework,
- field & airborne campaigns,
- and processing of in-situ data.

These prototyping and scientific activities must be brought together and industrialized for the operational processing of the FLEX mission.



Main mission characteristics

Orbit	Sun-synchronous 10:00 LT DN
Swath and resolution	150 km 300 m/pixel
Spectral range, sampling, resolution	500-780 nm Up to 0.1 (0.3) nm
Others	Tandem with S3 (OLCI+SLSTR)