



AURORA Project: Advanced Ultraviolet Radiation and Ozone Retrieval for Applications

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The AURORA Project

The **AURORA** project was proposed in response to a Call of the **Horizon 2020** framework programme of the EU.
H2020 Work Programme: 2014-2015
Research Area: Leadership in Enabling and Industrial Tech.
Sub-programme: Space

Call: H2020 - Earth Observation – 2015
Topic: EO-2-2015 Stimulating wider research use of Copernicus Sentinel Data.
Project duration: 36 months (Feb 1, 2016 – Jan 31, 2019)
Project Coordinator: Istituto di Fisica Applicata «Nello Carrara», IFAC-CNR, Italy (U.Cortesi@ifac.cnr.it)

AURORA web-site: <http://www.aurora-copernicus.eu>

Scope and objectives of the project

The idea at the core of AURORA is the exploitation of advanced products for **TROPOSPHERIC OZONE** and **UV SURFACE RADIATION** derived from GEO (S-4) and LEO (S-5, S-5p) platforms, based on **ASSIMILATION OF FUSED DATA** from different spectral regions (UV, Visible, Thermal IR).

Scientific objectives

- to investigate the potential of data fusion and data assimilation to convey complementary information content of measurements by the atmospheric Sentinel LEO and GEO missions into unique geophysical products.
- to focus the exploitation of the synergy between simultaneous and independent measurements of the same target on **tropospheric O₃** and **UV SURFACE RADIATION**.

Technological objectives

- to reduce the complexity of managing the high volume of Copernicus S-4 and S-5 data and increase its quality w.r.t. the operational outcome of individual instruments.
- to develop a prototype data processing system and demonstrate its capability to work with simulated data as closely as possible to the operational environment.

Application objectives

- to develop **two operational downstream services** (innovative mobile App for UV dosimetry and tropospheric ozone monitoring application for major cities and regional prediction of air quality)

Data Simulation

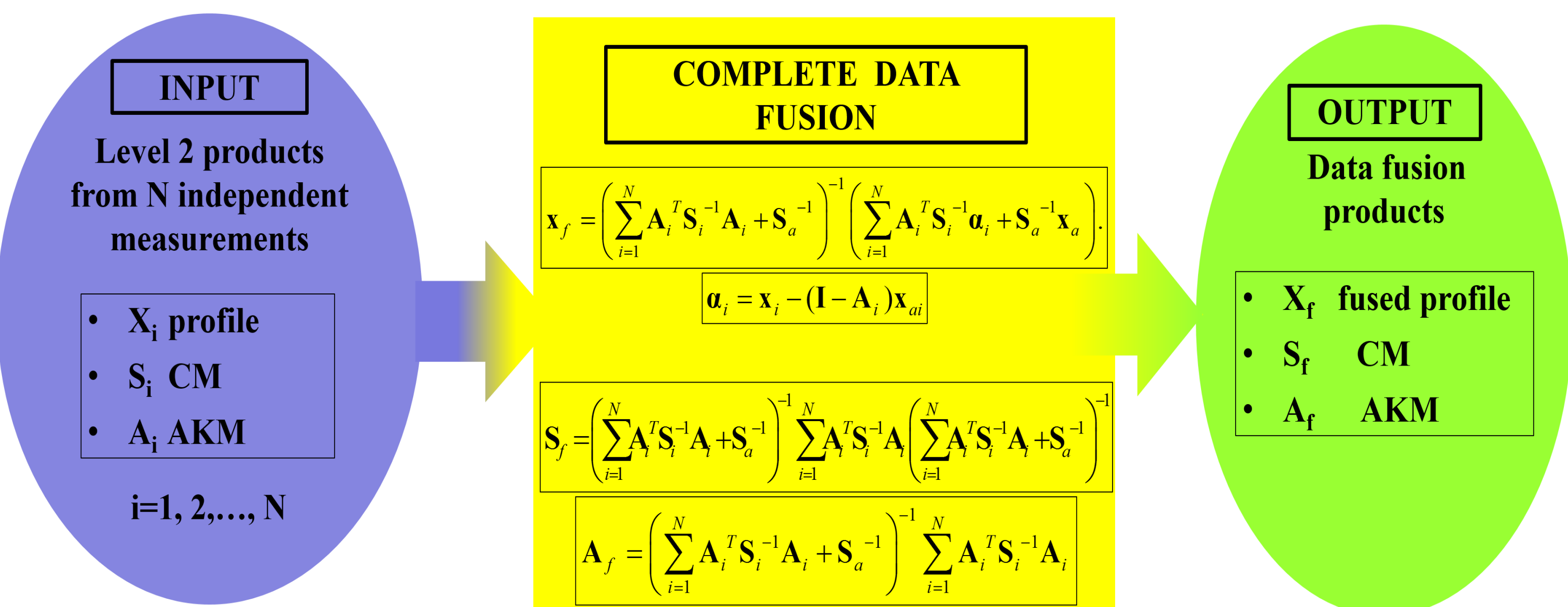
Retrieval products from S4 and S5 measurements in the UV, VIS and TIR will be simulated in conditions that replicate as closely as possible the operational environment.

Atmospheric Sentinels simulated data will be obtained from ad hoc atmospheric scenarios generated from the NASA MERRA-2 reanalysis [1] using currently available characterization of the relevant instruments onboard MTG-S and MSG.

Data Fusion

Data fusion is used to reduce the complexity of the huge amount of Sentinel data to process with no loss of information (e.g. by reducing the number of vertical profiles to assimilate).

The **Complete Data Fusion (CDF)** [2] method will be applied.

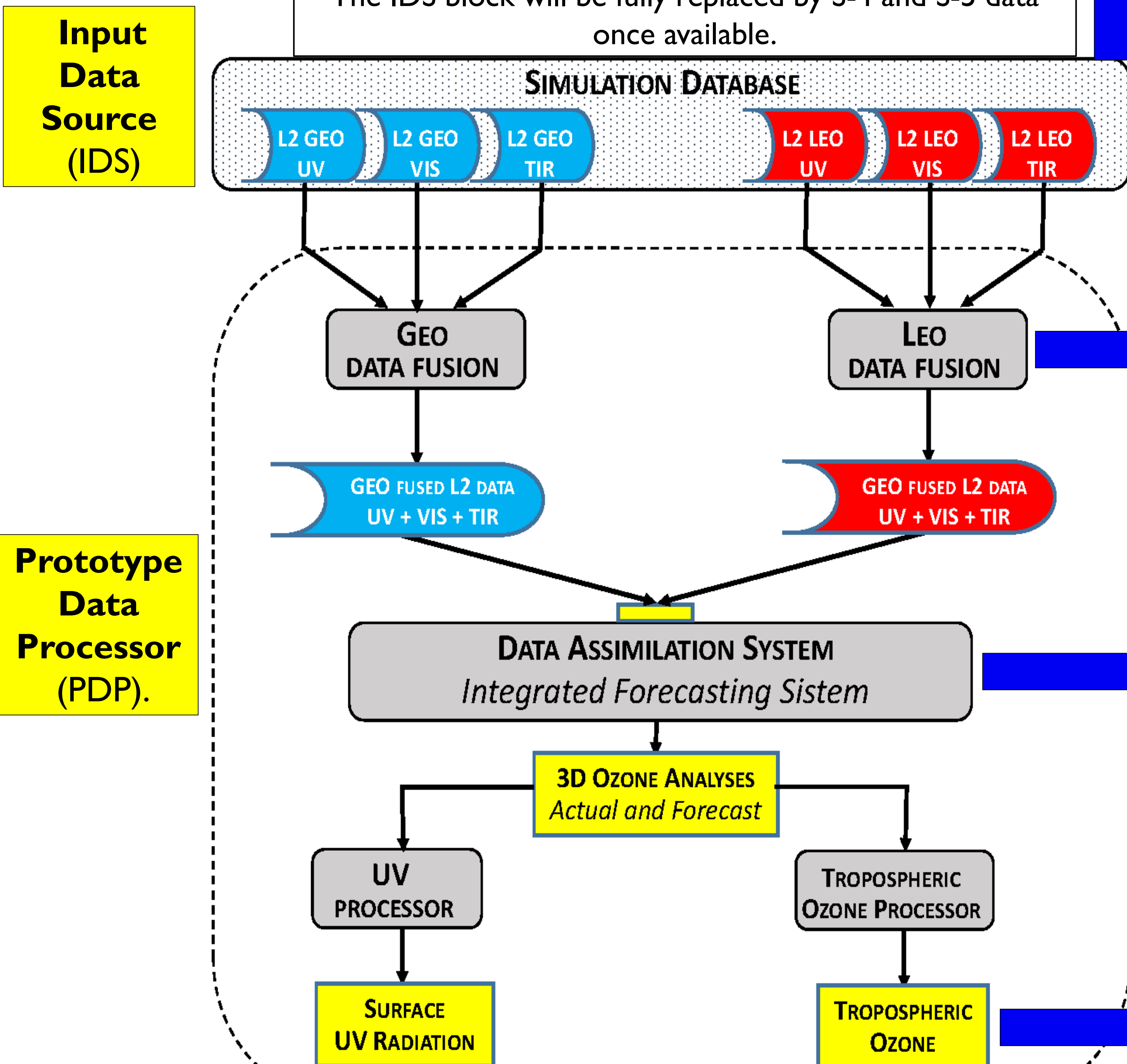


The **CDF** algorithm:

- takes into account both the covariance matrix (CM) and the averaging kernel matrix (AKM) of the profiles to be fused;
- provides results equivalent to those of the simultaneous retrieval;
- uses standard retrieval products and has very simple implementation requirements

AURORA data processing chain

The IDS block will be fully replaced by S-4 and S-5 data once available.



AURORA Technological Infrastructure : the project uses a cloud-based architecture for data processing

Data Assimilation

State-of-the-art Data Assimilation Systems (DAS) will be used to combine LEO and GEO fused profiles and contrasted with the assimilation of standard retrieval products (profiles from UV and TIR and columns from VIS).

Two DASs are available to AURORA:

- ECMWF Integrated Forecasting System (IFS);**
- KNMI Chemical Transport Model DAS (TM5).**

Data Products for Applications

Output → **Tropospheric Ozone** and **UV surface radiation**

- Development of two market solutions for pre-existing products (**Ozone Monitoring in Urban Areas** and **Personal UV Dosimetry**) that will be further improved thanks to AURORA's results, gaining a high added value with respect to currently available similar solutions.
- Development of innovative products and services during and after project lifetime.

References

- [1] Bosilovich et al., 2015: MERRA-2: Initial Evaluation of the Climate, Tech. rep., NASA TM-2015-04606, from <http://77gmao.gsfc.nasa.gov/pubs/tm/>
 [2] Ceccherini et al., 2015: Equivalence of data fusion and simultaneous retrieval, Optics Express, 23, 8476- 8488.