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**ULISSE : a knowledge management project for life and physical sciences from the International Space Station.**

*Christian Muller, Didier Moreau, Didier Gillotay, Etienne Haumont  
and the ULISSE consortium.*

*Belgian User Support and Operation Centre.*

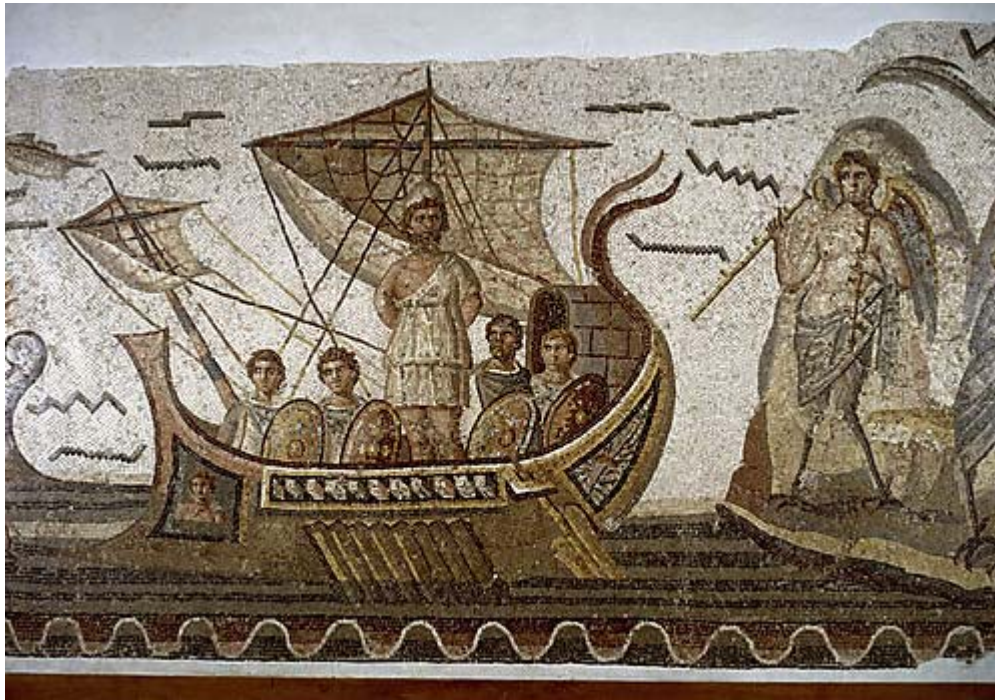


# Ulisse Partners

- Microgravity Advanced Research and Support Center S.r.l. (MARS), Italy, Telespazio S.p.A., Italy, Belgium Users support and Operation Centre, Belgium, Consiglio Nazionale delle Ricerche (CNR-ISTC), Italy, Institut de Médecine et de Physiologie Spatiales (MEDES), France, Space Applications Services (SpaceApps), Belgium, Centre National d'Etudes Spatiales (CNES), France, Università degli Studi di Roma "La Sapienza", Italy, Damec Research Aps - Danish Aerospace Medical Centre of Research, Denmark, Stichting Nationaal Lucht- en Ruimtevaartlaboratorium (NLR), The Netherlands, Deutsches Zentrum für Luft- und Raumfahrt (DLR), Germany, Eidgenössische Technische Hochschule Zürich (ETH), Switzerland, NTNU Samfunnsforskning AS, Norway, Centrum Badań Kosmicznych Polskiej Akademii Nauk (SRC PaS), Poland, Universidad Politécnica de Madrid, Spain, Werum Software & Systems AG, Germany, European Low Gravity Research Association (ELGRA), The Netherlands.

Essentially USOC's and partners in knowledge management





***Brothers,' I said, 'o you, who having crossed a hundred thousand dangers, reach the west, to this brief waking-time that still is left unto your senses, you must not deny experience of that which lies beyond the sun, and of the world that is unpeopled. Consider well the seed that gave you birth: you were not made to live your lives as brutes, but to be followers of worth and knowledge.***

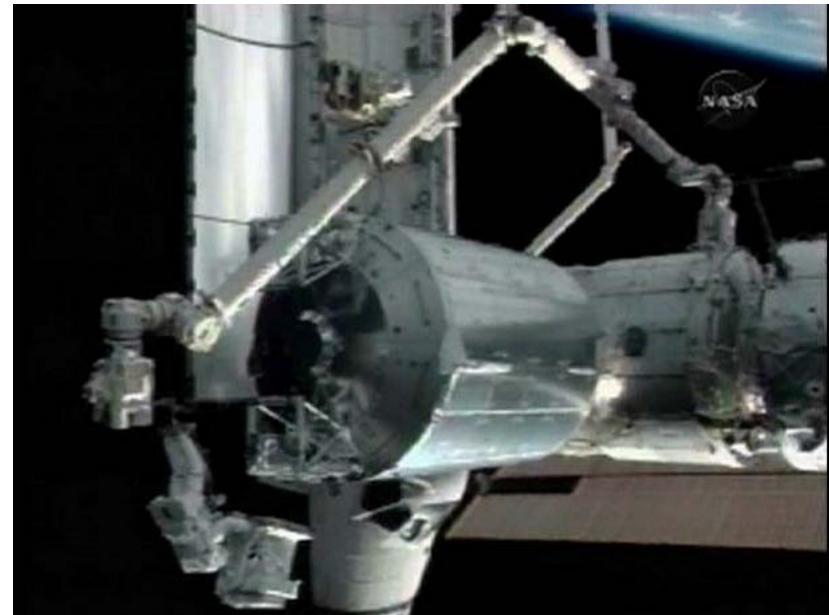
***Dante Alighieri, Inferno XXVI***

# The USOC network and relations of B.USOC ( UHB's etc).



# ULISSE organisation

- The USOC ESA network and partners in knowledge management and space medicine.
- ULISSE puts all the data in a knowledge base arranged according to a mark-up language.
- Ensures data perennity
- **Ensures data use.**



Installation of SOLAR on COLUMBUS  
SOLAR data will be one of the B.USOC contributions to the project

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# Why is this project necessary?

**Data:** The interpretation of scientific data requires additional information often distributed among different units of space agencies.

**Archiving:** the whole set of all data and information is generally collected by the investigator only, who is the sole responsible for data analysis and scientific evaluation.

**Knowledge dissemination:** scientific results are published by the investigator in one or more papers on scientific journals, thus oriented toward a selected public specialized in the same scientific discipline. Summaries of ESA experiments are published on ESA journals and on the Erasmus Experiment Archive.

The consequence of the present organisation for data archiving and knowledge dissemination is a strong limitation of:

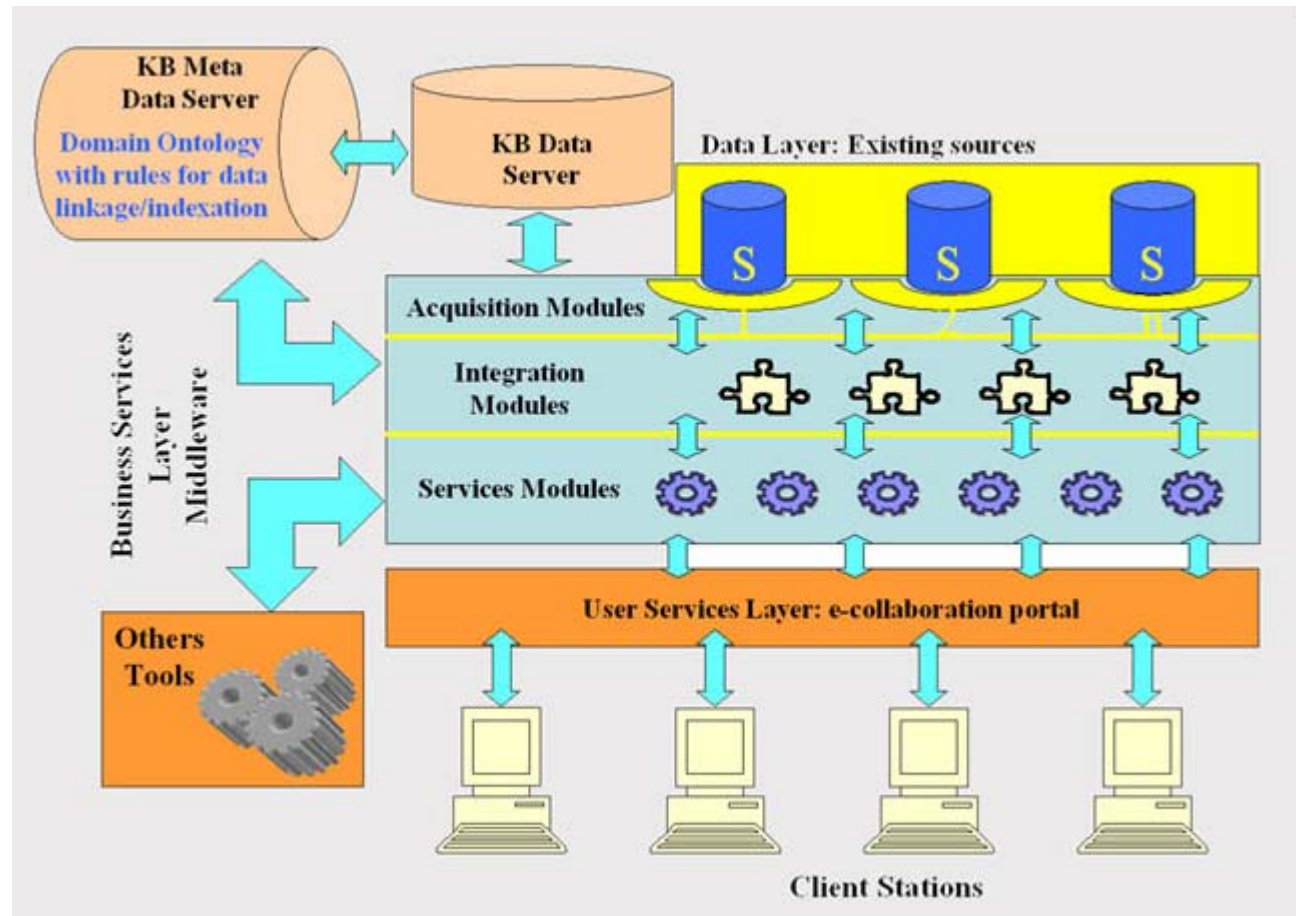
Re-utilisation of data for further deepening of scientific analysis;

Cross-fertilisation between different scientific areas;

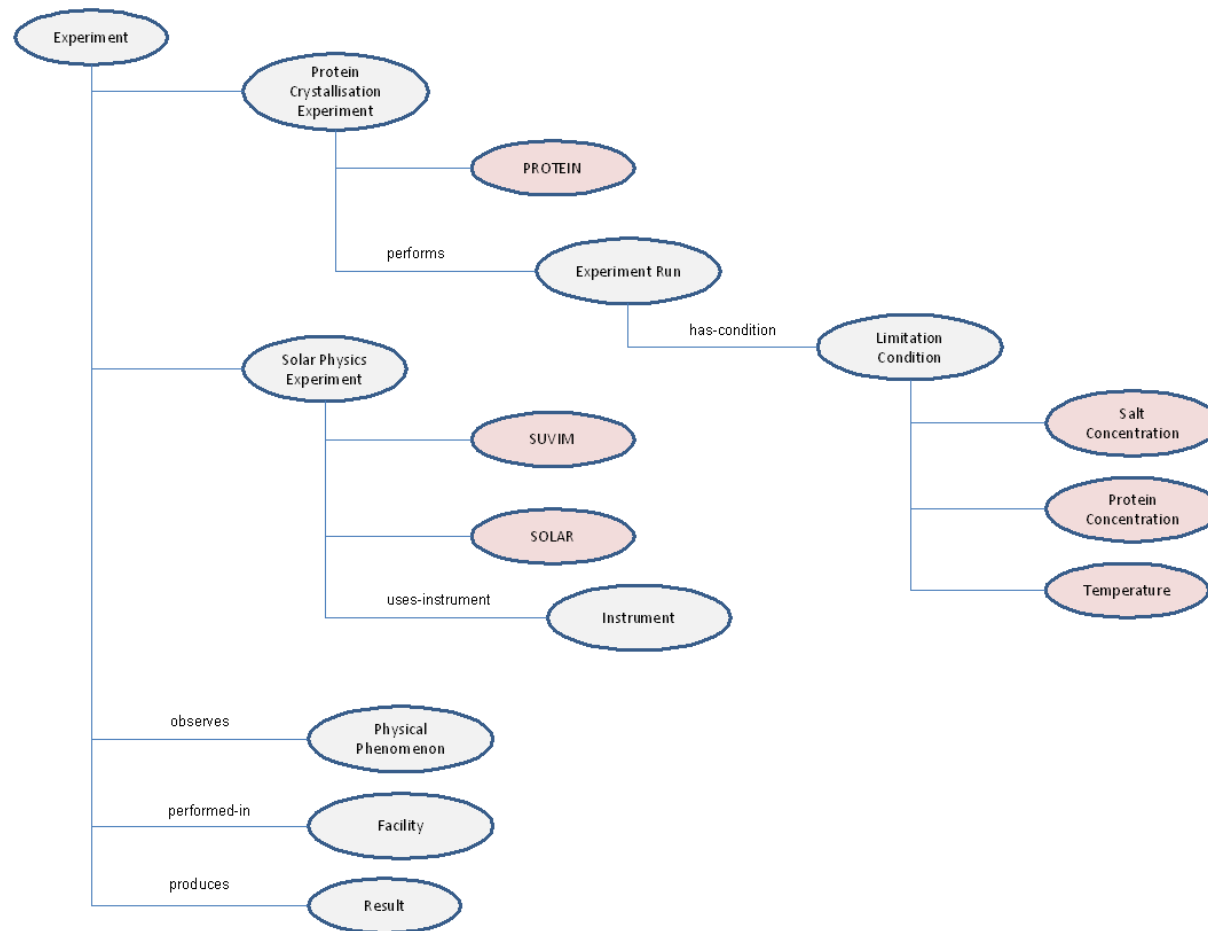
Generation of spin-off for terrestrial and/or space applications;

Information utilisation from the perspective of non-scientific stake-holders (as decision-makers and educational bodies).

# Ulisse project scheme



# Ontology of the various data treated by B.USOC in ULISSE



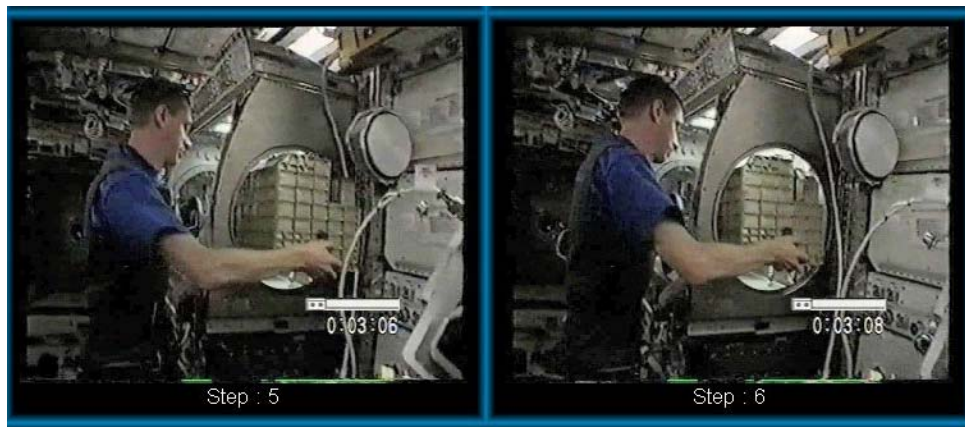


# B.USOC microgravity activities



protein crystallisation: in flight since 2002.

Transmits thousand of images of crystal growth, the real data are in the sample.



## PCDF on COLUMBUS (Protein Crystallisation Diagnostics Facility)



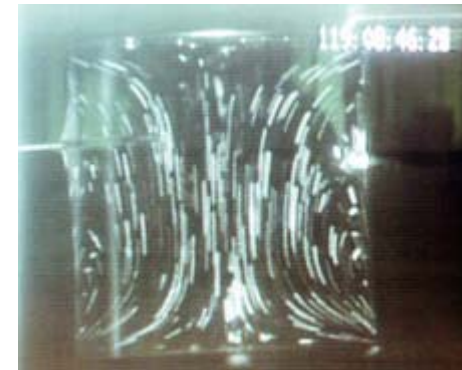
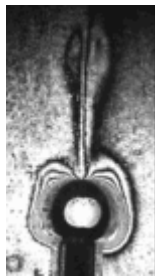
The first flight campaign took place in 2009,

The PCDF is composed of two modules: a processing units with four reactors which stays for an entire increment and which is uploaded and downloaded by the shuttle, an electronic unit which stays for a longer period on Columbus.

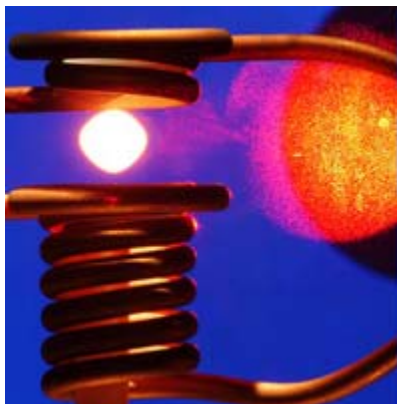
The first operation was completed in 2009.



Other USOC's have different specialisations in microgravity.



Fluid dynamics (MARS), convective phenomena (E.USOC)



Material sciences: alloys processing, metastable solid phases, crystal growth (DLR-MUSC, CNES-CADMOS)

Here also, the samples are the data together with in flight experiment parameters and images.

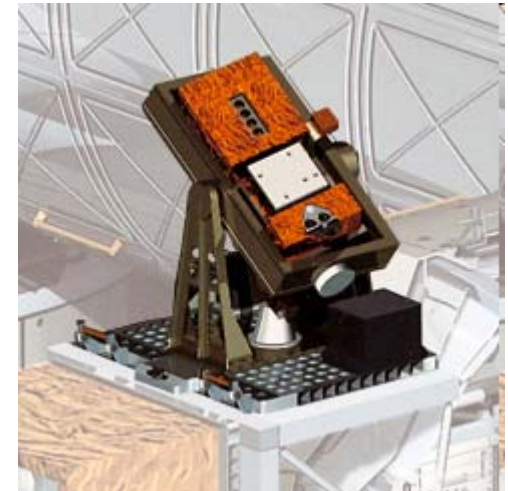
## Life sciences: two aspects

- Data obtained on astronauts in the station.
- Hospital experiments: bed rest, patient monitoring.



This subject leads to a new requirement on data: anonymising before distribution (CADMOS and MEDES, Toulouse.)

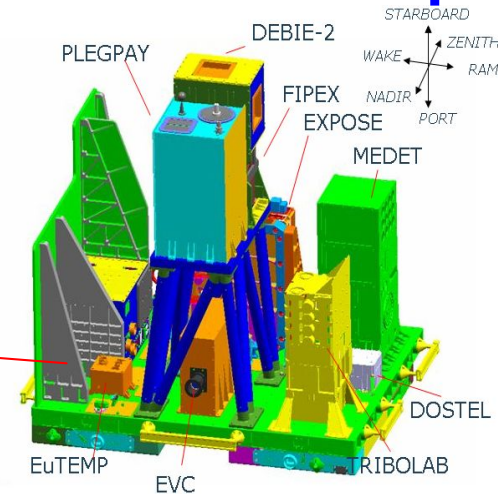
# Space and earth sciences.



SOLAR is a set of three instruments monitoring solar output.

The operations are managed by B.USOC as FRC.

## ULISSE activities versus the other external payload: EUTEF



**EUTEF is an experimental platform for external tests, the ULISSE EUTEF data are managed by NLR**

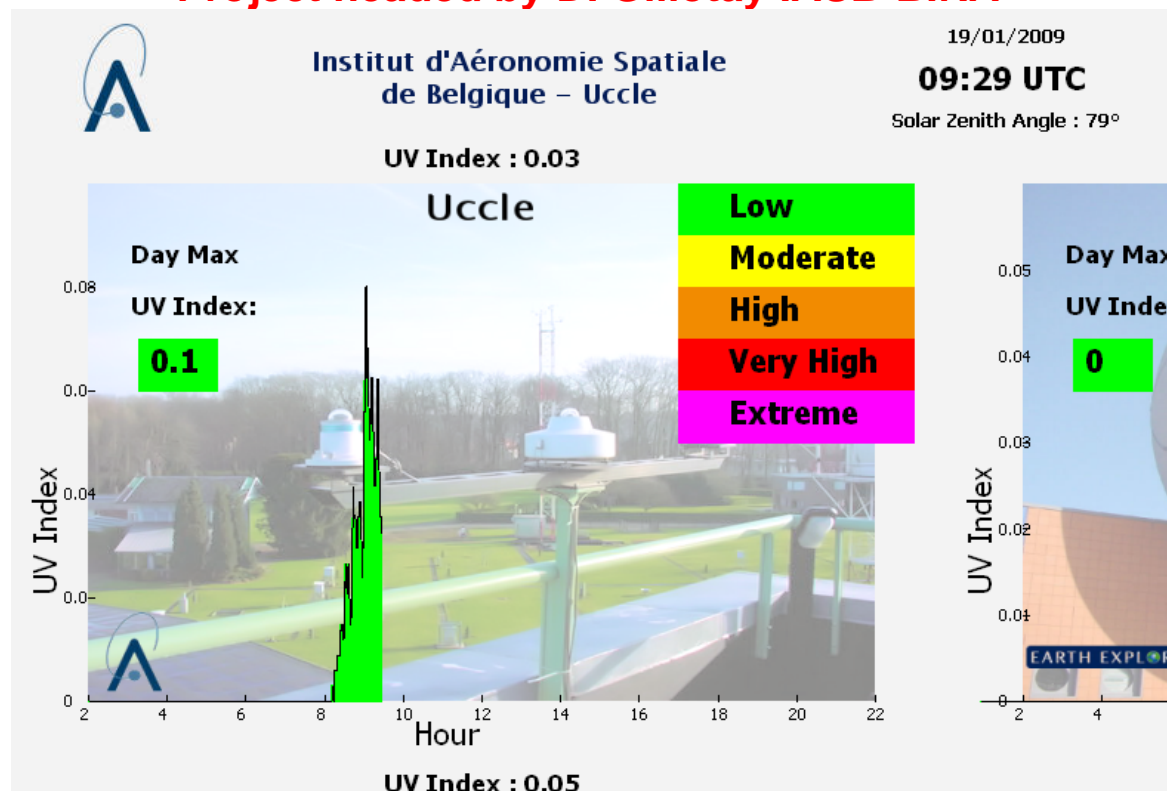
### Focus on two areas



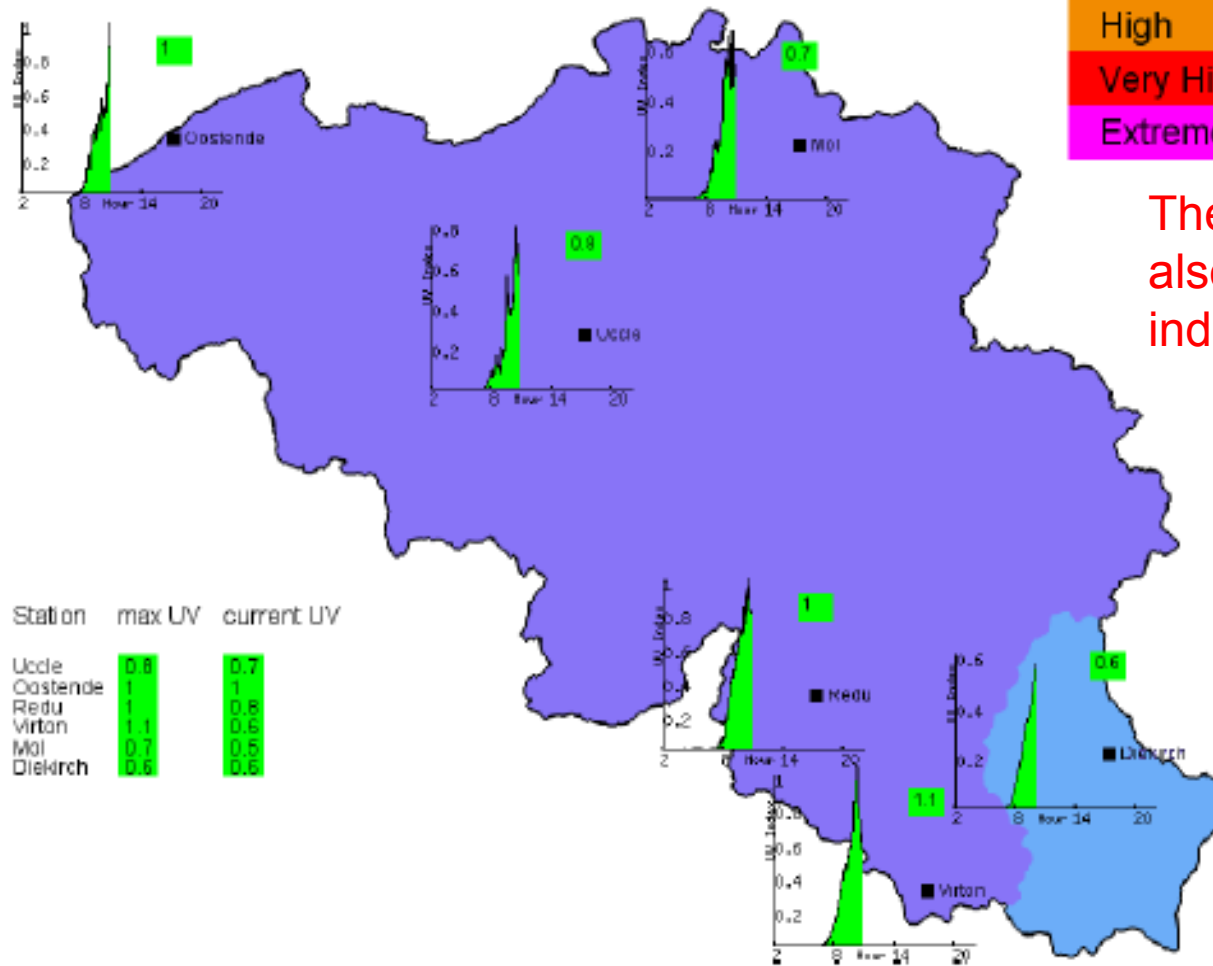
- Data integration demo for internal and/or external facility
- Application with integration between ISS data, external Space environment and simulation

# What does B.USOC already provide to ULISSE?

**A link to the UV network through the own UV measuring network of BIRA-IASB  
Project headed by D. Gillotay IASB-BIRA**



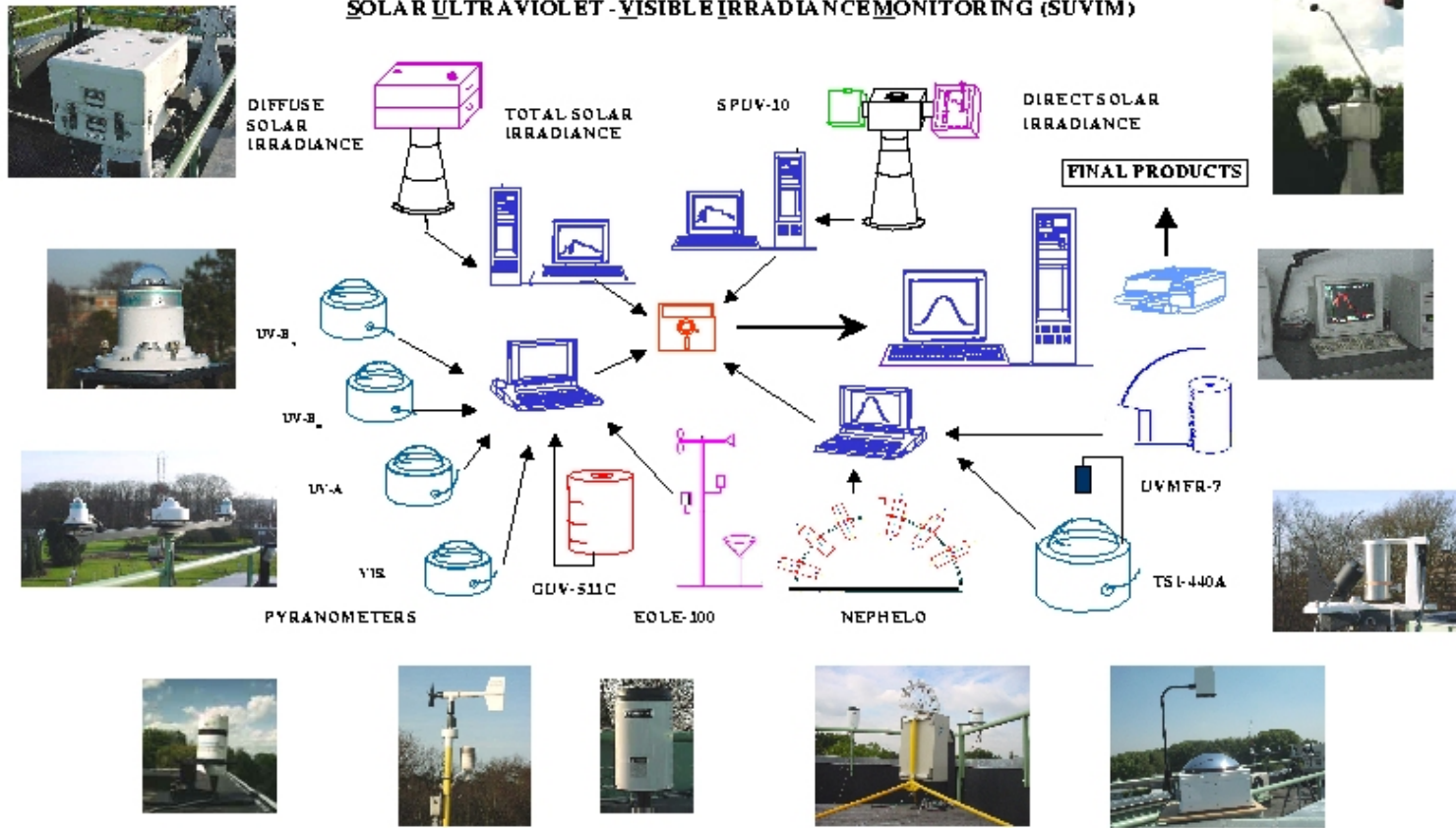




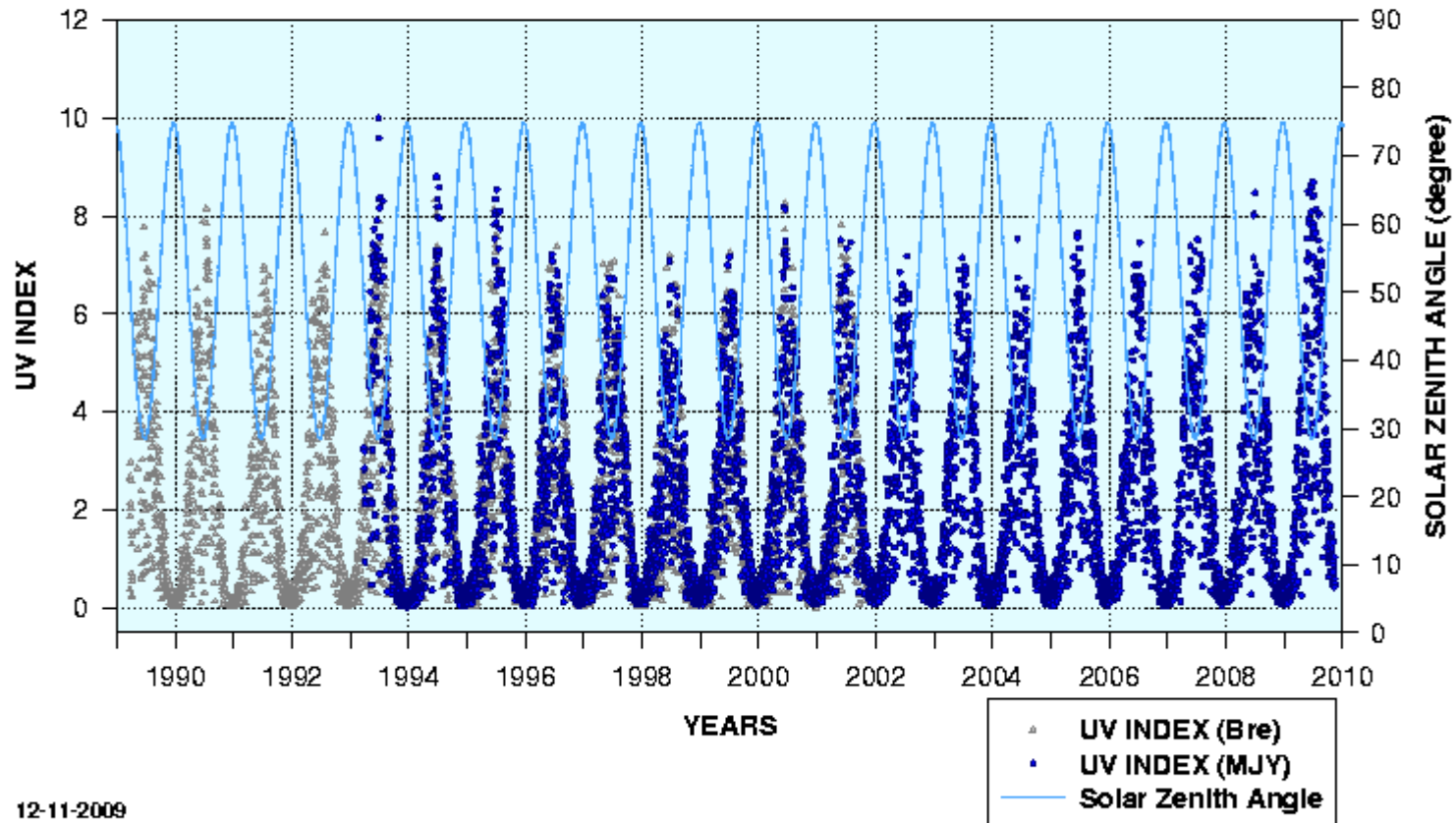
These data contain also solar activity indications.



**SOLAR ULTRAVIOLET - VISIBLE IRRADIANCE MONITORING (SUVIM)**

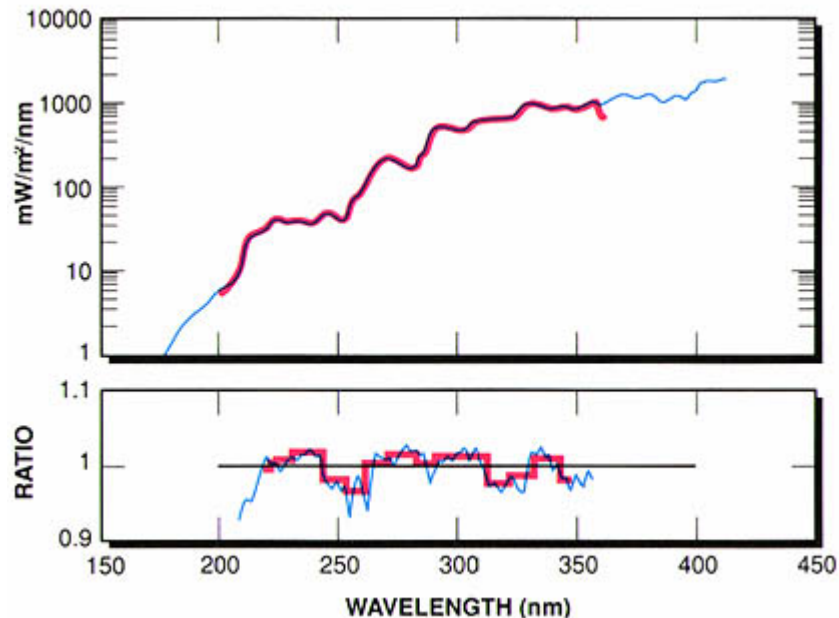


**UV INDEX AT NOON  
IN UCCLE (BRUSSELS) - BELGIUM  
(Lat. 50°47'54"N, Long. 4°21'29"E, Alt. 120m)**



12-11-2009

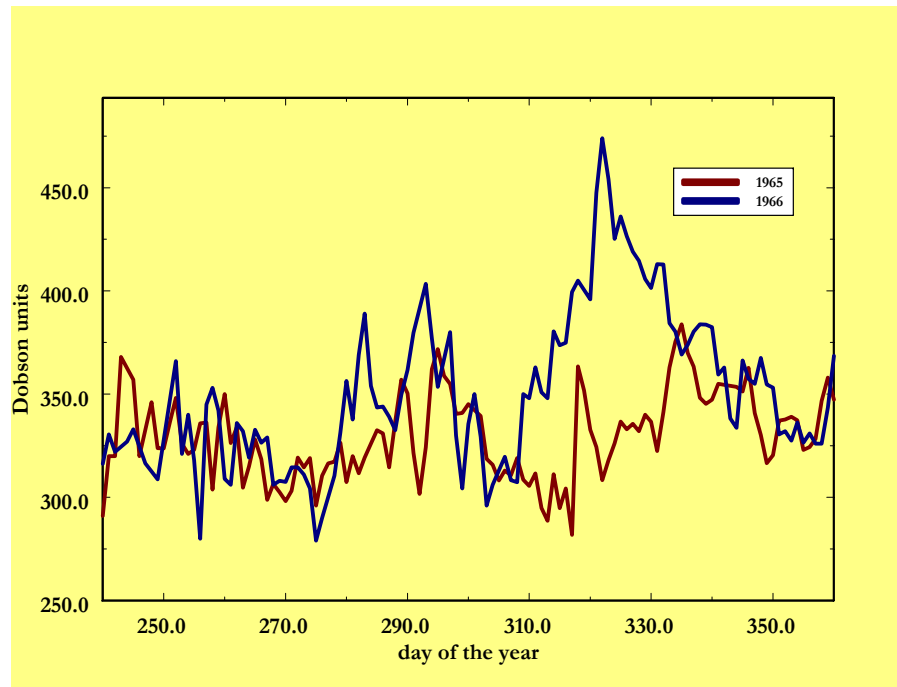
# SOLAR: why don't we have the data rights?



Comparison between SUSIM (NASA) and an earlier version of SOLSPEC on Spacelab 1 in 1983. A perfect spectrum is still the model the scientists are looking for.

- The data are not yet fully verified: belongs to the precision astronomy class and ESA will not allow its dissemination before final approval.
- The PI's have an objective which differs from ULISSE: they want to produce an ideal solar spectrum corresponding to the transition between cycles 23 and 24.
- PI's interested in space weather would have a different approach, they would also put on ISS and B.USOC different operational constraints: produce a forecast of solar anomalies.
- Forty years ago, scientists were even more restrictive as they were looking for the "solar constant", the paradigm of research could thus evolve.
- Scientists usually have to be convinced that their raw data have still value after final publication.

## An example of a change in paradigm: Antarctic ozone.



Daily averages of Antarctic ozone in spring from “Base Roi Baudouin”

- Column ozone was measured from 1965 to 1967 from “Base Roi Baudouin” in Antarctica, despite perfect treatment at the time, the Antarctic ozone hole was not addressed at the time.
- The specific problem was addressed forty years later by finding the original observation books, digitizing them and performing a retreatment.
- The results are now one of the proofs of the chemical origin of the ozone hole.
- **Publication does not close data use!**

# Project final objective.

- The project will lead to synergetic studies between space, life and physical experiments.
- This requires of course agreement from the data right owners.

