Report of EUFAR Workshop on European Airborne Data Processing

25th – 26th March 2004.
Paris, France.
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Background and Aims

The aim of the Data-Processing group workshop corresponds to EUFAR WP3 general framework: identify the domains in which co-operation within the EUFAR Network will bring most valuable benefits, improvements of the cost/effectiveness and the quality of service. Sessions were set-up in order to:

- Assess the state of current practises in data processing.
- Facilitate the exchange of ideas between European teams working on data processing.
- Investigate possible collaborative actions
- Identify the requirement for future European action.

Content of the meeting

The first session was dedicated to quick-looks and on-board processing. Three presentations where given: "*NCAR data display software*" by Chris Webster, "*Quick-look data processing at SAFIRE*" by William Maurel, and "*In-flight and post-flight data processing at MetAir*", by Bruno Neininger.
The theme of the second session was "Generalist processing tools", with presentations from Andreas Giez (*The DLR aircraft data processing software RAMSES, an overview*), Bruno Piguet (*AIDA: Météo-France processing architecture*), Chris Webster (*processing airborne data at NCAR/RAF*), and Thomas Spieß (*AME: a Processing and Visualisation software*).
The third and last session was dedicated to cloud microphysics, With Christophe Duroure presenting his 2D processing tools, and Oscar Serrano the FSSP-100, PCASP and GPS data processing at INTA.
Copies of the presentations are available on EUFAR web site.

Summary of discussions

Each presentation was followed by a few questions (a time for interesting and direct sharing of experience), and each session ended with a discussion on possible EUFAR action. The main points raised where:

1) Should EUFAR recommend a unified data format or processing toolbox?
The general opinion was that nobody is willing to shift from a working, functional tool to another one, solely for convergence reasons. On the data format issue, it appears that, nowadays, most teams are able to convert their specific format (if any) to and from some of the most common exchange format (ASCII, NetCDF), and that this solution covers most of the needs. About processing toolboxes, the only possible moment for a complete change is when a team is building a new

system, for whatever reason: It is, then, a natural move to choose a solution that appears to be efficient for colleagues, or one recommended by a coordination group. In that perspective, EUFAR action could be to maintain a survey of tools used by partners.

2) About the notion of quality in data processing.

There are more than one way to define the quality of processing. The first one is organisational, following ISO-9000 principles: ensure that the task is correctly defined, that there are means to measure deviations from standard operation and procedures to correct them. The second one is from he computer point of view: Is processing fast? Is it versatile (quickly meet campaign specific requirements)? Can it easily evolve (new sensors, new algorithms, new hardware)? Does it come with a wide range of tools (libraries)? And, last but not least, comes the scientific point of view: Does the algorithm correspond to state-of-the-art knowledge?

The scientific aspect is of major interest in the research field, but its scope is wider than this group: the chain begins by the knowledge of sensor, and cooperation is thus needed with instrument expert group: we have to envisage coordinated actions on specific questions.

3) Use of EUFAR web site.

EUFAR web site is generally considered as an asset for communication. Beyond its natural task (it will host all documents related to working groups action), it may also fruitfully be used to:

- Reference documentation. The site already hosts information about sensors and aircrafts. It should also contain (or link to) documents form operators. This can greatly contribute to EUFAR's goal: "Facilitate communication and new user comprehension of the domain".
- Give access to processing code. This is a suggestion from microphysics scientist, to support intercomparisons. It will also has an interest for the objective of EUFAR related to spreading of knowledge: even for basic functions, it has an interest to give access to real code, and not some kind of description, which can lack some details. Of course, it is not suited for sensor-specific processing, or brand new developments, which may be close to some kind of "trade secret". Participation is thus opened on a volunteer basis, with a purely formal selection criteria: enough documentation is provided

4) Inter-comparison of processing routines.

This is a proposal from microphysics scientist, a domain in which algorithm developments require reference sample and routine. The current web site can be used to serve most of this objective: provide sample sources and datasets. These kinds of actions are a way to facilitate integration and preserve variety (which are direct EUFAR objectives); but this doesn't make sense in all domains (for example, in the wind computation the part specific to the aircraft is the most important one). The group should ask thematic groups (other than microphysics) if they are interested. Radiation was mentioned: you can separate the aircraft information (Attitude, position, location of the sensors), from the sensor data processing. Sensors are generally similar within the fleet (Eppley/K-Z). One question remains: are there EUFAR possibilities on human resources for this kind of tasks?

Proposal for European coordinated actions:

In the scientific aspect of processing quality, the group identified the problem of error estimation as the topic that needs more developments. The first step could be a thematic common Data-Processing/Thermodynamics meeting on error estimation. This will also lead to recommendation to operators and funding agencies (see below).

In order to facilitate communication and new user comprehension of the domain, a lexicon of parameter definition should be constructed, and made available on the web site. Questions were asked if this task could be integrated in the education/training part of EUFAR FP6 project.

Effective co-operation within the EUFAR Network: The group believes that one of the most efficient way towards this goal could be an exchange/visiting program. The exact set-up of this program can be proposed as a possible EUFAR action, probably in conjunction with the education/training part of program.

Recommendations on "good practice"

1- Recommendations to Users

The first point the expert group wants to emphasize on is that, in the research world, the need is often for more than a standard processing: specific application require tailored data processing, varying from campaign to campaign, and from user group to user group, depending on the goal of the research: processing is adapted to the use of the data. This implies that processing is an *iterative process with the user*, and we can thus recommend that:

- Scientific user should be prepared to interact with the data processing team at all stages of a campaign: from the planning to the late refinements of the processing.
- Scientific users should have a knowledge of measurement and processing to determine if they need specific any kind of specific processing: read the documentation from operator (directly, or through EUFAR web site, when such information will be added)

2- Recommendations to Operators

The group wants to recall a fundamental principle: the goal of the processing is to deliver not only a number, but its meaning.

Data processing includes documentation production: sensor information (calibration procedure), algorithm used for computation and control. Good documentation increases the level of confidence and favour the iterative process of data validation.

More specifically, EUFAR recommendations to operators are:

- Deliver as much documentation as possible. Use EUFAR web site to refer this documentation. Don't forget that it is a possible way to improve visibility and citations.

- Computation of error estimation should be generalised.

3- Recommendations to Funding Agencies

The general recommendation is to support actions corresponding to EUFAR goals.

- Support an exchange/visiting program (maybe within education/training part of EUFAR).
- Support works on error estimation.
- Support work to enrich EUFAR web site scientific content: lexicon of standard terms in the airborne measurement, reference to state-of-the-art documentation on measurement and processing.