Report on the results of the GRAS SAF User Survey december 2002
Subtask of Work Package 21300 “User Contact”

v. 1

The GRAS SAF User Questionnaire was sent out by email on november 8 2002. The email consisted of a short email text with a read-me file, the Detailed Products Description Document, and the questionnaire itself attached. The email was sent to 65 primary and 80 secondary recipients (no distinction visible), with CCs to 9 EUMETSAT and GRAS SAF Steering Group members. By suggestion from Hans-Peter Rösli of Meteoswiss and Dave Offiler of the Met Office/GRAS SAF 8 additional emails were sent out on november 18.
Of the 162 emails sent out 17 did not reach their recipient due to “user unknown”, “timeout”, “mailbox full”, and the like, 5 recipients answered with emails but without filling out the questionnaire (two of them indicating, though, that they would fill it out “soon”), and 16 filled out and sent back the questionnaire (5 of these through colleagues answering on behalf of the recipient).

The survey yields many interesting answers and suggestions, especially the answers to question no. 7, 8, 10, 11 and “Other Comments” should be noted and taken into account in the further GRAS SAF work.

In the following all answers will be listed, both as numbers in tic boxes and as text. The 16 recipients who filled out the questionnaire are identified by the letters A – P.
Detailed lists of all recipients and answers can be obtained from me (frr@dmi.dk), in case of interest.

Frans Rubek, january 14, 2003

Questionnaire results:

Optionally, a short description of your work field(s):
A: Development of active remote sensor products for use in NWP, climate research & modeling. Sensors include surface- and space-borne GNSS receivers, Doppler, Lidar.
B: Sounding systems, ground-based remote sensing
D: Head of the Satellite Section
E: Work package manager "Water Vapour in the Atmosphere", CM-SAF
H: Managing operational NWP, and especially the use of observations in data assimilation.
J: Ionosperic physics, space weather and mesosphere researches.
K: Responsible for data assimilation algorithms in NWP section.
L: NWP for operational use.
N: R+D into assimilation of satellite data into NWP forecast systems.
O: Software engineer (1), chief scientist (2)
P: Assimilation of remotely sensed (actually ATOVS) data in Limited Area Model ALADIN.

SOUNDING PRODUCTS	**useful / would like to use**			
	yes	*no*	*possibly / yes, on condition of…*	*comments*
Near-Real Time refractivity profile	11	3		*G: Phase 2, operational* *H: Probably the observable we would like to assimilate* *M: Initial assimilation parameter in 3D-Var* *O: For comparison/validation with CDAAC*
Near-Real Time profile of temperatu-re, pressure and specific humidity	6	3	4 *(D: Possibly to validate our 1D-Var algorithm)* *(H: Possibly, for validation)* *(P: On condition of "fine" horizontal resolution)*	*O: Idem*

Near-Real Time surface pressure	5	5	3 *(D: Possibly to validate our 1D-Var algorithm)* *(H: Possibly, for validation)*	
Offline refractivity profile	7	5	1 *(D: Possibly for validation)*	*G: Phase 2, operational* *H: … except maybe for specific cases requiring specific investigations* *O: Idem*
Offline profile of temperature, pressure and specific humidity	8	7	1 *(D: Idem)*	*H: Idem*
Offline surface pressure	4	9	1 *(D: Idem)*	*H: Idem*
Product quality indicator	14	1		*D: As a matter of priciple for internal quality control*
Error estimate quality indicator	14	1	1 *(H: Possibly, for improving quality control)*	*D: Idem*
SUPPORTING PRODUCTS	**useful / would like to use**			
	yes	*no*	*possibly / yes, on condition of…*	*comments*
Bending angle profile	7	2	3 *(C: Perhaps later)*	*D: On the long term, if and when we develop bending angle assimilation capability* *H:* [No] *… as we would prefer to rely on preprocessing performed somewhere else to produce refractivities… unless the assimilation of bending angles is proven definitely superior*
Impact parameter time series	6	3	2	*D: Idem* *H: Idem*
Precise Orbit Determination vectors	5	3	4 *(N: If assimilating bending angles in 2-D plane)*	*D: Idem* *H: Idem*

Local radius of curvature	4	4	3	*D: Idem* *H: Idem*
Background profiles	5	6	2	*H: Idem*
Meta-data	4	4	3	*D: Idem* *H: Idem*
OTHER PRODUCTS	**useful / would like to use**			
	yes	*no*	*possibly / yes, on condition of…*	*comments*
Validation products	12	1	1	*D: Some of the products like analysis of refractivity quality would definitely be useful*
Error-covariance matrices	12	2		*D: Essential for 1D/4D-Var applications* *H: No – if it applies to sounding products*
SOFTWARE PRODUCTS	**useful / would like to use**			
	yes	*no*	*possibly / yes, on condition of…*	*comments*
1d-var pre-retrieval software	9	1	3 *(H: Possibly for validation/monitor-ing* *(P: On condition of good horizontal resolution (use in now-casting))*	*A: I assume colleagues in NOAA's NWS/EMC will want to use or review these.* *C: In HIRLAM consortium.*
3d-var assimilation software	10	1	3 *(P: On condition of good horizontal resolution (use in ALADIN model))*	*A: Idem* *C: Idem* *D: What are the mentioned observation operators? Are they not already part of 1D-Var?*
Pre-processing tools	9	2	1	*A: Idem* *C: Idem* *D: For interfacing with our NWP system.* *H:* [No] *… unless the need appears to treat bending angles*

SPECIFIC QUESTIONS:

1) For what purpose will you use the indicated sounding products? *(E.g. numerical weather prediction, climate monitoring, …)*

A: Investigation of impact on NWP (w/ NCEP & NASA's DAO). Climate studies – upper level temp, investigations of N as climate product.
B: Profile comparisons, climate monitoring
C: At the moment our answer reflects only the use in NWP (HIRLAM) and the possible use in synoptic work. Climate monitoring has not been taken into account.
D: NWP
E: Input into CM-SAF HCP (Humidity Composite Product)
F: Investigate its use as ancillary data for the retrieval of trace gas parameters out of GOME-2/METOP
G: NWP
H: NWP
I: NWP & data assimilation
J: Ionospheric prediction for HF communication and navigation correction, computing the ray of the radio wave in ionosphere, and research of the mesosphere.
K: Numerical weather prediction and control of other observations.
L: NWP
M: NWP, WP
N: NWP, model validation
O: We would use these products for reference and comparison. If possible, we would like to obtain your Level 0 data *and process them ourselves, comparing our values with your values.*
P: NWP, now-casting

2) For what purpose will you use the indicated supporting products?

A: Supporting research – quality control, etc.
B: Assess the quality of profiles.
D: For developing strategy of direct assimilation of bending angles.
E: Data assesment within merging procedure.

H: Perhaps validation and monitoring.
I: Research to refine assimilation strategy (does not *have to be available in NRT)*
J: For the need of the above purposes.
K: To gauge the influence of the background fields on the retrievals.
L: Supporting NWP monitoring
N: NWP
O: Reference and comparison, as above.
P: Weather prediction

3) For what purpose will you use the indicated software products?
A: Comparisons & sanity checking, as a minimum.
C: Data assimilation
D: To adapt and validate a refractivity 1D-Var methodology and later on develop a direct assimilation of refractivity profiles
F: Same as 1)
G: Dev. of variational data assimilation.
H: As the observation operator in 3D/4D-Var.
J: For development of Chinese occultation observation in the future.
K: To derive temperature profiles with different ancillary data.
L: (As above)
M: For (test) assimilation in case we don't get resources for developing our own assimilation software.
N: NWP (3D/4D-Var)
O: For comparison with our algorithms.
P: Profile retrieval and data assimilation.

4) Your opinion on the vertical/horizontal resolution of the sounding products?
A: Vertical – 1 km. Horizontal – I did not realize we had a choice!
B: Vertical resolution seems too coarse for the low troposphere. Accuracy seems too low for profile comparisons.
D: More than adequate for the vertical (provided the announced accuracy is achieved). Some concern about the degree of vertical correlation for the refractivity products. The horizontal coverage is not adequate but we are at a very early stage and will have enough [time] *to develop methodologies for using at best these new data.*
E: Vertical: Fine. Horizontal: As fine as possible.

F: The vertical resolution is more than adequate for our purposes. The horizontal resolution is not clear from the DPDD.
G: On the limit of usefulness for high resolution NWP, a positive impact is expected for data over oceans/arctic areas.
H: 1 km on the vertical is OK. 500 soundings per day globally is OK.
I: 500 m – 1 km vertical is sufficient (for our purposes)
J: Vertical resolution 200 m is enough, but horizontal one could not be better. Hope that the vertical resolution of ionospheric data can be improved to 2-3 km.
K:Sufficient for data sparse regions.
L: Good
N: Adequate in horizontal, OK in vertical.
O: Seems fine to me ☺
P: We would like to use these products in a numerical limited area model. The horizontal resolution should be less or equal to 100 km.

5) Your preferred way of receiving products?

GTS / RMDCN **11** FTP **8½** DVD / CD-ROM other _____
(in BUFR format, cf. DPDD for details)

I: GTS for NRT, FTP for offline

6) Do you need the archiving facility (where it will be possible to obtain old data on request)?

A: Yes
B: Yes
C: No
D: Preferably
E: Possibly yes
F: Yes
G: Yes, for impact studies
H: Perhaps occasionally, for specific case studies.
I: May be useful to some case studies afterwards.
J: It is best, and convenient for researcher.
K: Yes

L: No
N: Unlikely
O: Yes – We would prefer to transfer large batches of old data for batch comparisons.
P: Yes

7) What operating system would you prefer for the software products?
Unix/Linux **15** Windows **1** other _____

8) Section 2.4 of the DPDD describes some limitations in deriving temperature and humidity profiles from radio occultation data, in that ancillary data is necessary. If you plan to use GRAS SAF temperature and/or humidity profiles (either NRT or Offline), how much should ancillary data be allowed to influence or constrain these profile products?
A: My biggest concern is that the ancillary data used are clearly specified & characterized.
B: It seems very important, at each altitude, to know the %age coming from the measurement and the %age coming from the ancillary data.
D: We do not want side effects of ancillary data, i.e. we want to use the ECMWF NWP short range forecast to perform the refractivity inversion (in 1D-Var or 4D-Var)
E: As little as possible (ideally no influence). Influence information (estimation) may be useful.
G: Will not be used.
J: It is better to use the regional data, as 100 sets.
L: To a limited extent.
O: No opinion, but I would be interested in knowing what compromise you end up with.
P: We would prefer if level of influence of ancillary data on profile products could be controlled by the user.

9) The sounding product profiles will be provided as function of four different variables: Ellipsoidal height, height above Mean Sea Level (strictly: the geoid), geopotential height (calculated geometrically), and pressure level. Would you like the products to come as function of something else?
A. Not necessary.
B: No.
C: Present specification seems to be sufficient.
D: Too early to say, pressure levels seem fine.

E: Pressure levels and geopotential height.
F: No
G: Our assimilation wants data on pressure levels. We guess that ancillary meteorological data are needed to bring the data to pressure levels. In order to avoid this we want data on heights above mean sea level.
H: No
I: No
J: I would like the sounding product profiles as function of the height above the mean sea level.
L: No
N: No
O: We generally do all our comparisons in Mean Sea Level height. Since geoids might be different, I would be interested in ellipsoidal height as well.
P: No

10) The DPDD still contains a number of points labelled "TBD" (To Be Determined) or "TBC" (To Be Considered). Do you have preferences or suggestions to any of them?
B: No
D: With 500 profiles per day, providing an individual covariance per sounding product seems achievable. This would be much preferred to a universal matrix per product type.
E: 3.4/3.5 ? Structured with weather types? (Additionally) information as numerical values together with the data.
F: No
G: No
H: No
I: No
L: No
O: Section 4.9: I like times in GPS seconds with date stamps in the form: yyyy.ddd.hh.mm.ss
Section 5.3: For POD data, the SP3 format is nice …
Section 6: For validation products it would be nice to have a breakdown of how many occultations passed each stage of processing: occultation table, excess phase, dry profile, wet profile.
P: No

11) What type of quality information for the sounding products would you like to have?

A: Error covariances; SNR; Multipath flag ? (if signal drops out, is subsequently recovered, for example)
B: 1) Cf. 8. 2) Any error estimate is welcome. 3) It would be interesting to have a designated flag for suspect data.
D: What is described in 4.10 sounds reasonable. It is only when we start assimilating the refractivity products that we may come up with further suggestions.
E: Flags/indicators with the individual profiles/profile layers, including flag for geographic coordinates/"station height". Indicator for the horizontal representations?
F: Quality flag indicating the "goodness" of a measurement.
G: Estimated STD of observation errors and possible correlation between observation errors vertically/horizontally?
H: Quality indicator of the observation profile.
I: Indicator when fly-wheeling is on (if applicable for GRAS receiver?). Quality indicator of the level of tracking (useful for lower troposphere tracking).
J: The quality information you choose is OK.
L: % confidence or estimated error.
M: It would be nice to have the height at which fly-wheeling occurred included in the profiles, or at least made available later for control of its influence.
N: Flags for threshold tests etc., 1D-Var cost-at-convergence, lowest level for closed loop processing.
P: It would be good to have information on deviation from radiosonde profiles.

OTHER COMMENTS:

D: ECMWF is very interested in the GRAS SAF products that will be made available to the user community. We are chiefly interested in assimilating refractivity profiles so that the disentangling of the "humidity ambiguity" is performed in a dynamically consistent way within our assimilation scheme. This is why our preference goes towards refractivity products, associated errors, and of course pieces of software to help us developing a VAR strategy (probably 1D and later on 4D).
The description of the 3d-Var pieces of software is too vague in the document for us to have an opinion about our interest.
Please note that ECMWF is also interested in pieces of software linking bending angles to refractivity profiles since in a longer term, assimilation of raw products may be contemplated.

E: Date & time, for instance: yyyymmddhhmmssss

I: Specify in the Level 2 the geometry of the mean *occultation* plane *(either position of the satellites or angle of the occultation w.r.t. some reference).*

M: The most important quality info is that on simple profiles, because it is hard to access by users. Any degradation due to poorer orbit precision etc. should be reported.

N: Highly desirable to provide (if available) non-METOP RO data with (as far as possible) identical processing and delivered with a common format.

O: Please see http://www.cosmic.ucar.edu/cdaac/fileFormats for information on file format choices we have made for COSMIC/CDAAC. Thanks!