Draft Recommendations not in order of priority: Trace constituents

J. P. Burrows, D. Fussen, D. Loyola, and M. Lopez Puertas

R1 The meeting endorses the recommendations from the ATMOS User Meeting in 2012. All of which are relevant

We recognize that some projects have been initiated to address some of the deficits in 2012.

However progress to meet the recommendations is limited. This may in part result lakc of clarity of mandates in Europe between EU, EUMETSAT, ESA and EEA etc.

2012 - R4: Studies/projects aimed at exploitation of the synergism of the ESA and Third Party Mission data need to be established.

Draft Recommendations not in order of priority: Trace constituents

J. P. Burrows, D. Fussen, D. Loyola, and M. Lopez Puertas

R1 The meeting endorses the recommendations from the ATMOS User Meeting in 2012. All of which are relevant

Comment: progress on some areas but other still missing. We highlight again one important point already mentioned in the report 2012 "A climate data record of the unique and complementary cloud properties derived from the oxygen A-band measurements should be created by exploiting the available ESA and Third Party long-term data set (GOME, SCIAMACHY, and GOME-2) as well as future missions (Sentinel 5P, 4 and 5)"

2012 - R6: There should be dedicated funding aimed at young scientists to develop human capacity and to ensure expertise for future missions. No progress here

Draft Recommendations not in order of priority: Trace constituents

J. P. Burrows, D. Fussen, D. Loyola, and M. Lopez Puertas

R1 The meeting endorses the recommendations from the ATMOS User Meeting in 2012. All of which are relevant

2012 - R8: The existing validation infrastructure, a part of a global multimission validation network, for current and future missions should be maintained and enhanced.
This point was discussed yesterday with particular emphasis on (a) validating mesospheric data and (b) better use the technical improvements of lidar systems

2012 - R11: There is an urgent need for the realization of missions to observe high resolution vertical profiles from the UT/LS region, including the stratosphere, the mesosphere up to the lower thermosphere. The participants recommended to (a) strongly support CarbonSat, (b) support the development of small satellite missions complementary to the Sentinel missions and (c) to start the development of limb missions to recover the capabilities from ENVISAT

Draft Recommendations not in order of priority: Trace constituents

J. P. Burrows, D. Fussen, D. Loyola, and M. Lopez Puertas

R2 Long term data sets

the meeting recommends the continuity support of work for the level 0-1 and level 1-2 data products by the Instrument Quality working groups supported by ESA and the national agencies.

Draft Recommendations not in order of priority: Trace constituents

J. P. Burrows, D. Fussen, D. Loyola, and M. Lopez Puertas

R3 Sentinel 4 and Sentinel 5 Performance and calibration

R3A Performance

we recommend that non compliances in the Sentinel 4 and Sentinel 5 are rapidly resolved by the instrument design meeting the currently defined Instrument requirements not by relaxing the instrument requirements. The non-compliances in Sentinel 4 and S5 endanger the quality and therefore usefulness of 20 years of data.

Draft Recommendations not in order of priority: Trace constituents

J. P. Burrows, D. Fussen, D. Loyola, and M. Lopez Puertas

R3 Sentinel 4 and Sentinel 5 Performance and calibration

R3B Calibration

we recommend that the calibration of S4 and S5 be optimized in 3 respects:
i) the amount of time for calibration need to be provided in the schedule.
ii) an adequate scientific team is involved in the calibration and the Level 0 – 1 processor be made available and used to test and verify the quality of the instrument key data.
iii) the instruments stored for many years need to be tested and recalibrated prior to launch.

The currently the calibration time has been reduced in the schedule has been reduced by 60%. We consider this endangers the mission. There are also no spectral measurements in the plan – one of the great successes of the GOME and SCIAMACHY. There will be 2 S4 FMs and 3 S5 FMs constructed more or less simultaneously.

Draft Recommendations not in order of priority: Trace constituents

J. P. Burrows, D. Fussen, D. Loyola, and M. Lopez Puertas

R4 the lack of planned missions for vertical profile of atmospheric constituents from 8 to 150 km.

This is required atmospheric composition, numerical environmental prediction, stratospheric ozone, solar terrestrial interactions and space weather. We recommend that Europe has atmospheric constituent profiling instrumentation. An optimal combination of measurements in solar and thermal infrared (including the FIR and microwave) spectral ranges is required. Recent studies have shown the potential impact of the climate change in the upper atmosphere:

a) Thermospheric density changes might be (partially) accounted for by faster cooling (and contraction) of the lower atmosphere due to higher CO2 in MLT (Emmert et al., GRL, 2010)

b) Trend in COx (CO+CO2) in the MLT from ACE and SABER is much larger than expected from the anthropogenic CO2 increase in the lower atmosphere => there might be secular changes in vertical transport in the mesosphere (Emmert et al., Nat. Geo., 2012, Yue et al., GRL, sub., 2015).

Draft Recommendations not in order of priority: Trace constituents

J. P. Burrows, D. Fussen, D. Loyola, and M. Lopez Puertas

The middle and upper atmosphere is the intermediate region between the biosphere and the Geospace. Thus it is the propagation region of top/down natural phenomena (influence of the Sun on the troposphere) and bottom/up, anthropogenic effects propagating upwards.

Thus, to understand the atmosphere as a whole is crucial for accurately knowing each of its parts.

According to the recent results, it is important to continue monitoring the middle/upper atmosphere, in particular for understanding the anthropogenic effects on it and with possible/potential consequences on the atmosphere contraction (affecting, e.g. satellite navigation). Measurements of pressure/temperature, the carbon budget (CO+CO2) and NOx (a natural source producing important losses of O3 in the polar stratosphere) would be crucial parameters to measure in this region. Other as O3, and H2O are also highly desirable.

A mission with main focus on the troposphere and stratosphere could very well fulfill the objectives of the middle/upper atmosphere just by measuring only a small fraction of time. Limb emission in the IR would be the most desirable because of its global coverage. Current missions: SABER, ACE, and MLS. All already in space for more than 10 years. No instrument is currently being planned to be launched. The gap is assured but we should mitigate it.

Draft Recommendations not in order of priority: Trace constituents

J. P. Burrows, D. Fussen, D. Loyola, and M. Lopez Puertas

R5 Validation

Long term validation involving ground based, aircraft and balloon measurements is essential. The latter are best, when combined with scientifically driven missions. The former require support for ground based measurement instrumentation and networks, which is currently not there.

Validation (in this region): Not now, we better have an instrument and then talk about validation. However, I'm in favor for strengthening the facilities for validation of tropospheric/stratospheric products.

Draft Recommendations not in order of priority: Trace constituents

J. P. Burrows, D. Fussen, D. Loyola, and M. Lopez Puertas

R6 Use of ISS and small satellites new missions

We recommend the exploitation the ISS and the use of small satellites to meet this need induced by the lack of mission for scientific payloads which can be used for the next generation of operational payloads. *Please note the ESA Explorer Mission was originally intended to be on a much more rapid time scale. ISS can be and is to some extent already used as an atmospheric observatory* ***just not by Europe****.*