



Report on the 5th WMO observations impact workshop, Sedona, AZ, 22-25 May 2012

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The workshop

- WMO organizes this kind of workshop every 4 years

last workshop was in 2008 in Geneva, Switzerland

(http://www.wmo.int/pages/prog/www/OSY/Reports/NWP-4_Geneva2008_index.html)

in 2004 it was in Alpbach, Austria

(<http://www.wmo.int/pages/prog/www/GOS/Alpbach2004/Agenda-index.html>)

- Participation is only by invitation, and the project is mainly sponsored by WMO
- This year we were invited to report ALADIN and HIRLAM activities
- I reported LACE and HIRLAM activities
(I have got very good reports from Florian Meier, Magnus Lindskog, Benedikt Strajnar and Nils Gustafsson. But I believe that much more many other colleagues contributed to these results)

The sessions

- Session 1 Impact of observations on global forecasting models
- Session 2 Impact of observations on regional forecasting models
- Session 3 Any other scientific issues

The session 1 – Global forecast impact study (1)

- **Utility used in evaluation:** Observing System Experiments (OSEs);
 - Impact on forecast system: adjoint based tools such as Forecast Sensitivity to Observations (FSO);
 - Impact on the analysis system Degrees of Freedom for Signal (DFS) and others

- **Operational systems:** four-dimensional data assimilation schemes (4D-Var, Ensemble Kalman filters and hybrid systems)
 - Significantly improvement in use of observations

- **Top 5 (not necessary in this order):** AMSU-A (microwave temperature sounder), AIRS/IASI (hyper-spectral infrared temperature and humidity sounders), radiosondes, aircraft observations and atmospheric motion vectors (AMVs) from geostationary and polar orbiting satellites

The session 1 – Global forecast impact study (2)

- **Individual observation:** Radio occultation data based on the global positioning system (GPSRO) has substantially impact;
 - GPSRO is important role to anchor the radiance data assimilation;
 - One data type depends on combination of other observations; at centres, where less radiance are assimilated for ex., AMV can play higher impact (the case of NRL, where lot of AMVs are used)

- **International coordinated projects:** Impact of observation during different international projects were also reported (for ex. CONCORDIASI, etc...)

The session 1 – Global forecast impact study (3)

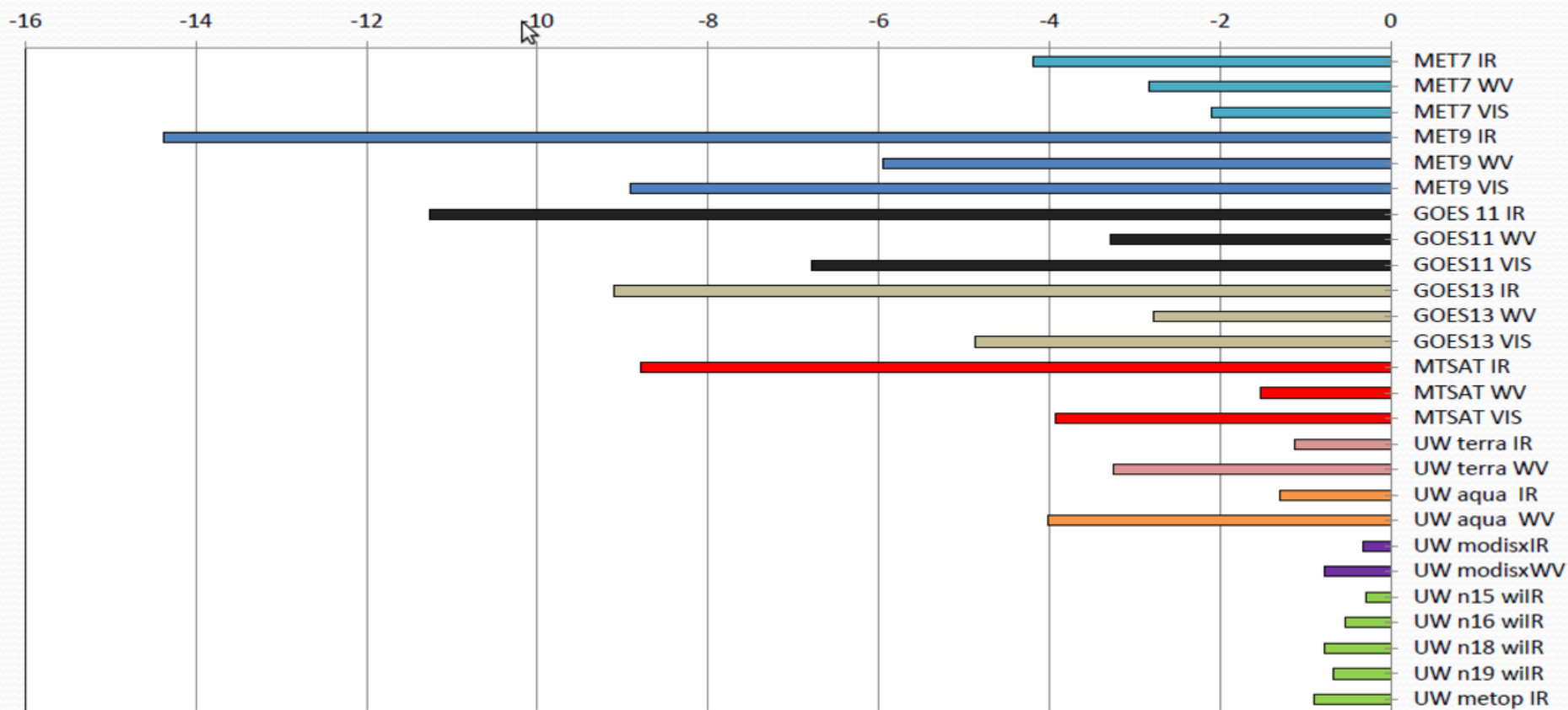


Summer 2010

Aug 15th, 12 UTC through Sept. 30th, 12 UTC

Observation impacts computed every 6 hrs

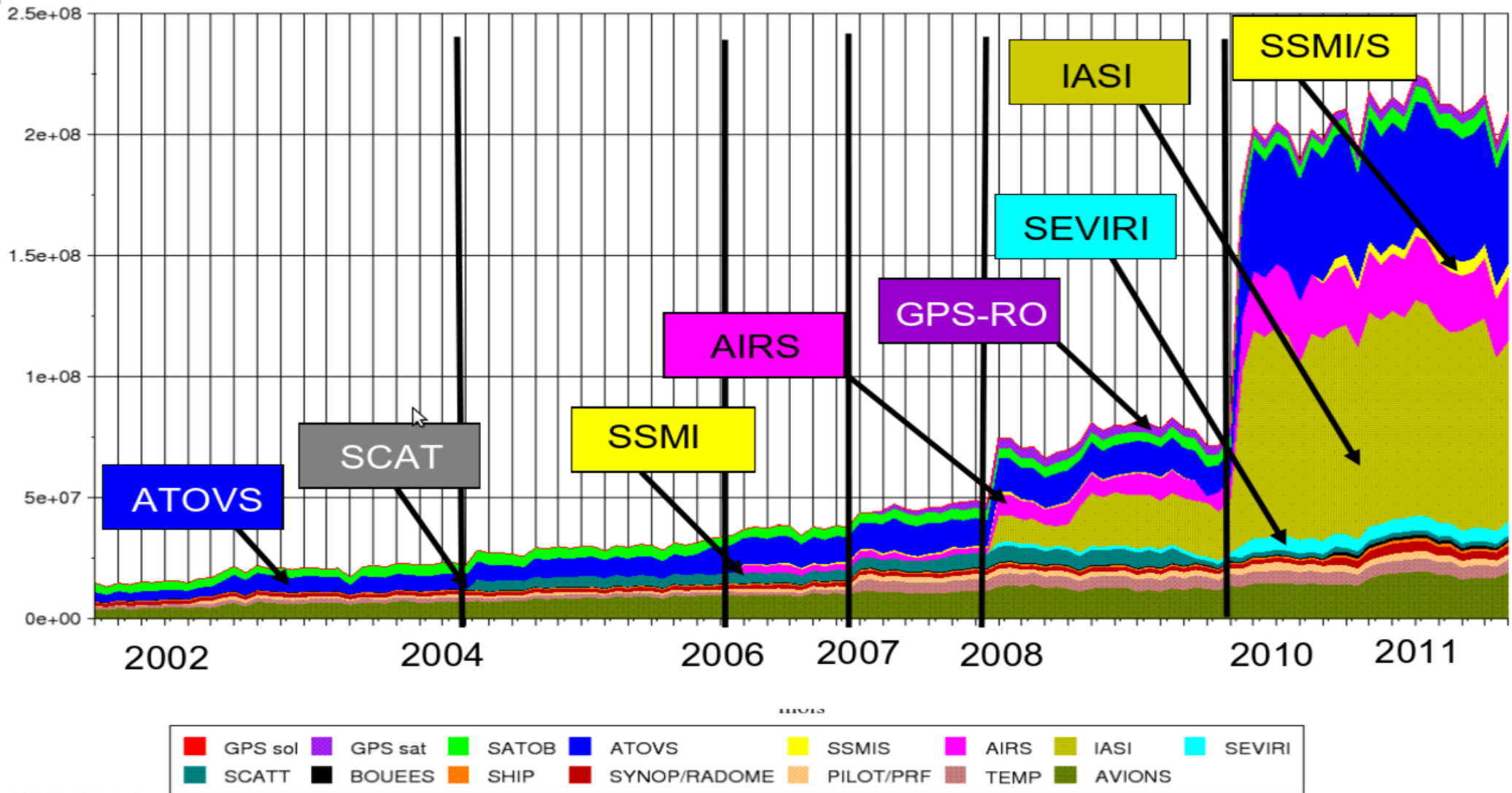
AMV wind control



Most impact from IR wnds, however VIS winds have greater impact that WV winds!

The session 1 – Global forecast impact study (4) Meteo France global data usage

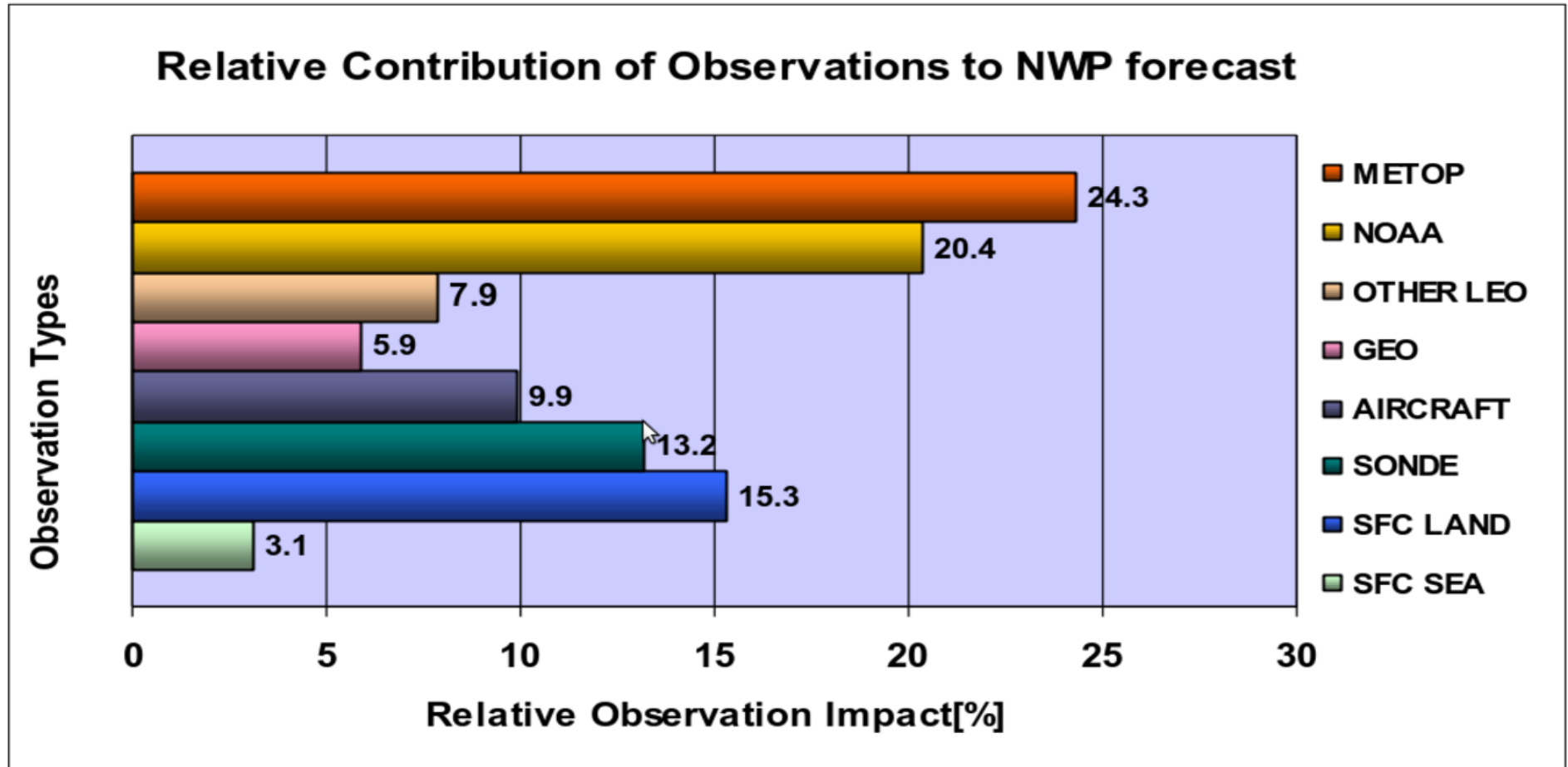
Monthly number of observations used in the global model



The session 1 – Global forecast impact study (4) example the MetOffice result



Forecast sensitivity to observations (FSO): importance of Metop data



The session 2 – Regional forecast impact study (1)

- **Utility used in evaluation:** Observing System Experiments (OSEs);
 - Impact on forecast system: adjoint based tools such as Forecast Sensitivity to Observations (FSO);
 - Impact on the analysis system Degrees of Freedom for Signal (DFS) and reduction of error variances

- **Operational systems:** three-, and four-dimensional data assimilation schemes (3D-Var, 4D-Var, OI, nudging)
 - Significantly improvement in use of observations

- **Top 5 (?):** Top 5 varies from one region to the other. The availability of observation over different regions as well as the geographical extension of the LAM can also considerably change the order of importance of observation type from centre to centre. For ex. the amount and the quality of wind profilers and the presence of TAMDAR over the US, importance of polar orbiting satellites in the high-latitude, Radiosonde and AMDAR over central Europe, etc ...

The session 2 – Regional forecast impact study (2)

Exchange of more observations between regions: The results of recent impact studies provide strong support for exchange of more observations between regions, and between countries within regions: e.g. GPS-ZTD, radar, hourly surface observations, and MODE-S data at airports.

Model spin-up: Progress has been made on addressing model spin-up, but it is still a ***significant problem*** limiting the benefit and impact of assimilated observations in terms of precipitation forecast skill.

The session 3 – Scientific issues (1)

- There is a strong requirement for observing system impact assessments coming from both the WMO members (NMHSs), the space agencies and other managers of observing networks.
- The NWP community has a range of well-established tools to carry out observation impact assessments.
- There is some hesitation amongst the scientists about getting too closely involved in policy decisions, especially regarding elimination of observations.
- There is a general recognition that additional metrics are needed beyond the traditional objective scores such as anomaly correlation, root-mean square error and total energy in the case of FSO. Metrics that are more closely related to high-impact weather and service delivery should be developed and explored.
- The European EUCOS programme is a useful model for coordination and optimisation of regional observation networks; the adoption of a similar approach to address specific issues is recommended for other regions and application areas..

The session 3 – Scientific issues (2)

- The THORPEX-DAOS working group recently delivered its comprehensive report on observation targeting. Its main message is that there has been a paradigm shift in targeting with respect to 8 year ago; there is now less optimism about targeting having a breakthrough impact in the extra-tropics. The technique has however been demonstrated to be effective for tropical cyclone forecasting.
- In response to the Report, the workshop recommended that targeting continue to be investigated on the data assimilation side, e.g. via the state-dependent use of satellite observations in sensitive areas.



More detailed report will be prepared for the next EWGLAM meeting ...