SLP Pilot Project Report

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Activities

- Organize and host WMO-DBCP workshop that was held in Sedona, Arizona, on May 21, 2012. Report and presentations available at http://www.wmo.int/pages/prog/www/OSY/Meetings/Wshop-Impact-NWP-5/dbcp/dbcp_slp1.html
- Presentation of workshop discussion at DBCP 28 S&T Workshop
- Started drafting BAMS paper on the subject

WMO-DBCP Workshop

- Attendees:
- Carla Cardinali (ECMWF)
- Luca Centurioni (Chair, SIO)
- Ronald Errico (NASA)
- John Eyre (UKMO)
- Ron Gelaro (NASA)
- Rick Lumpkin (co-Chair, AOML)
- Jean-Francois Mahfouf (MeteoFrance)
- Wenjian Zhang (WMO).

Workshop format

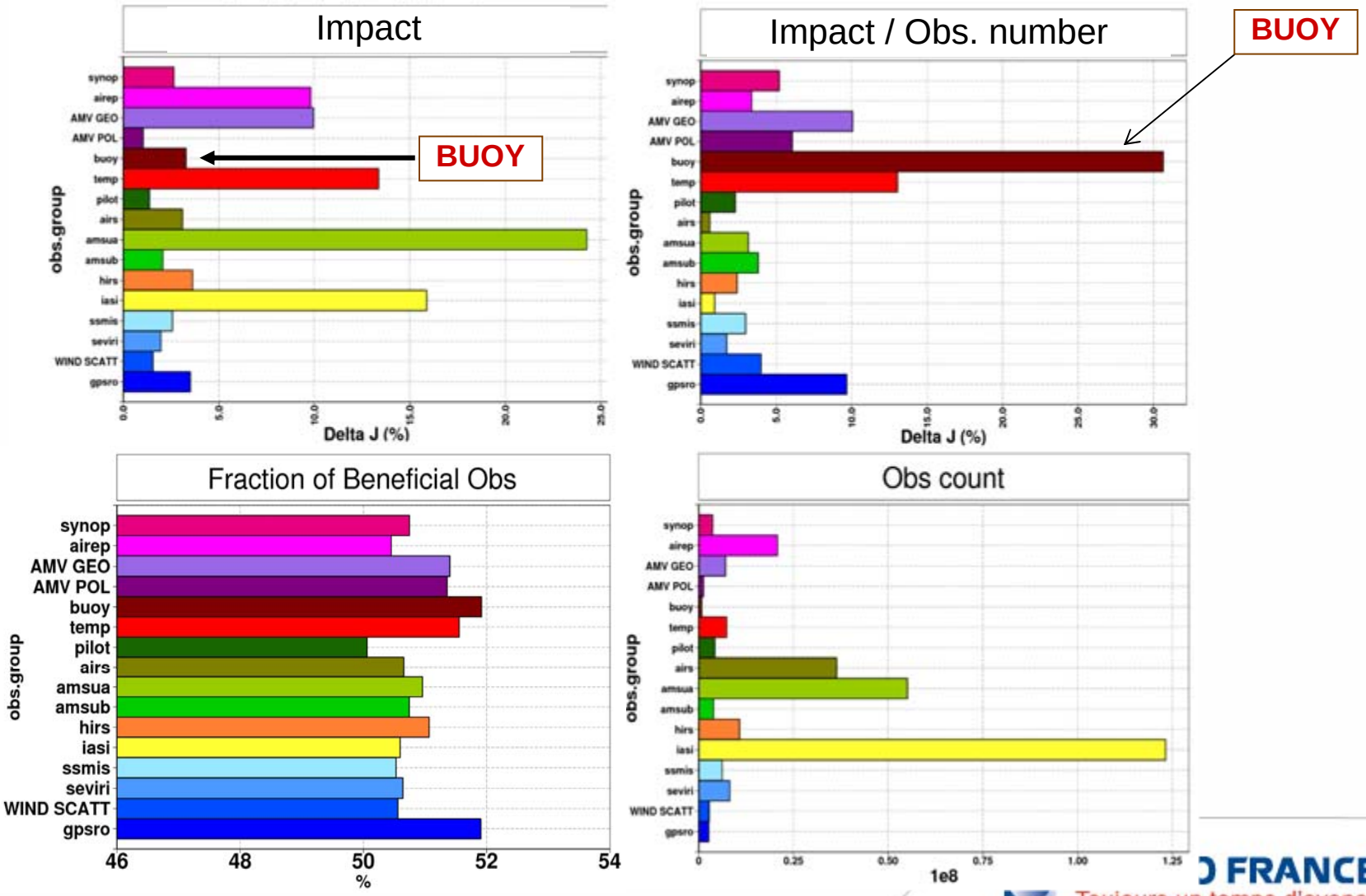
- **Presentations and free discussion**
- Themes for discussion:
- What is our understanding of the benefits of SLP data from drifters on NWP and are further investigations needed for a quantitative assessment?
- What are the correct methods and metrics to assess the benefits?
- Are we ready to summarize the state of the art on the subject in a manuscript that could be submitted to a peer-reviewed journal such as BAMS?

1) Impact studies

- Use adjoint approach
- The adjoint uses the linearized tangential model and it is used to compute the “impact” of the observations given a certain metric;
- The advantage of this method is that it is run routinely by many NWP centers

(http://gmao.gsfc.nasa.gov/products/forecasts/systems/fp/obs_impact/)

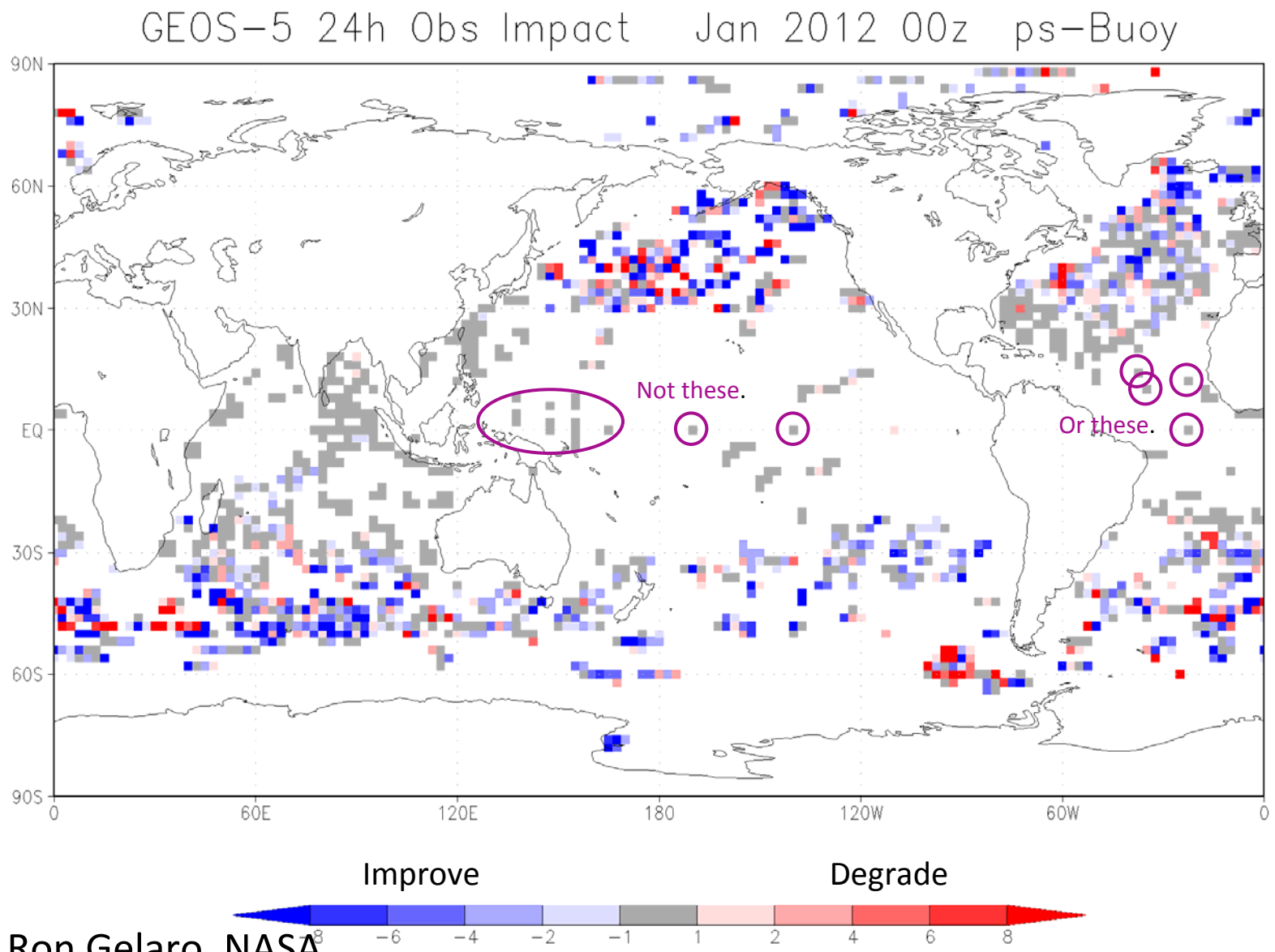
Forecast impact experiment from Dec. 2010 to Jan. 2011



Credit Jean Francois Mahfouf, MeteoFrance

Identification of Drifting Buoy Observations

January 2012

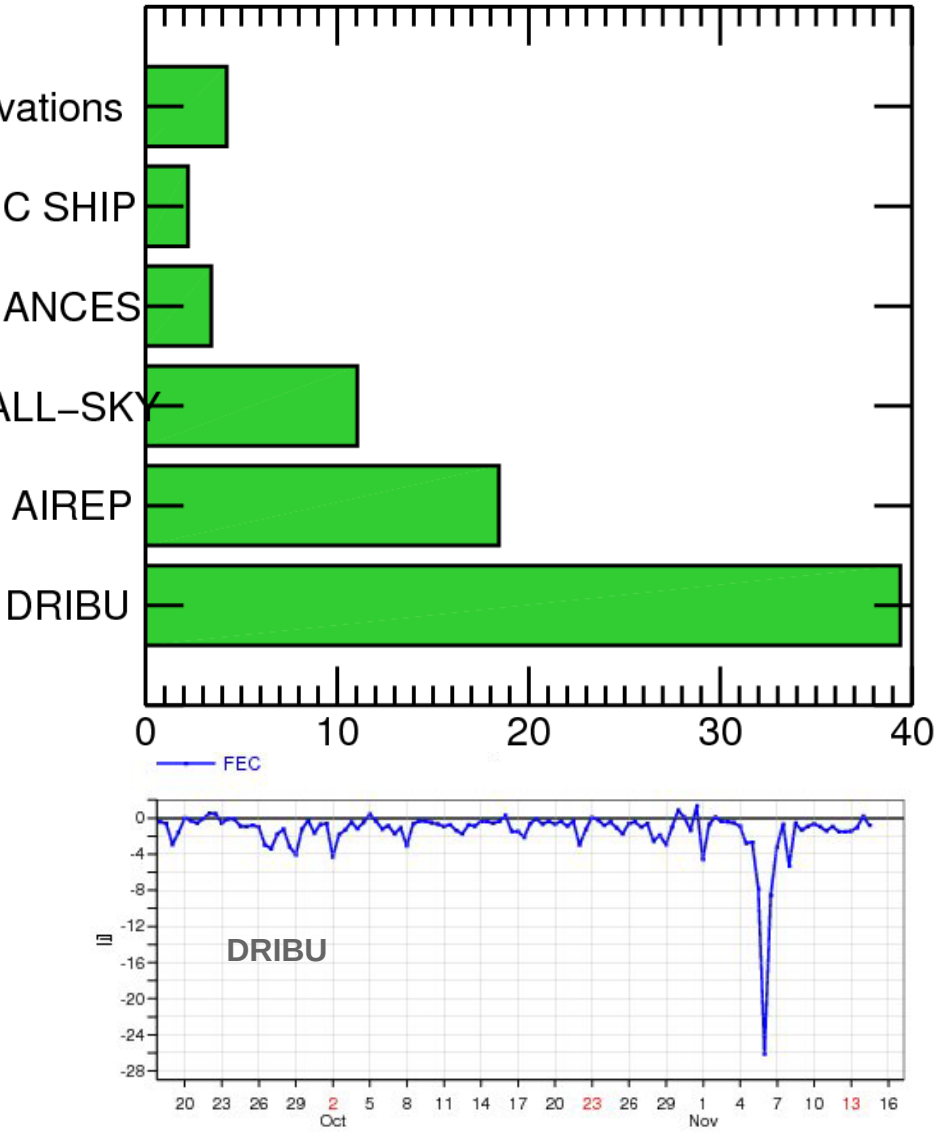


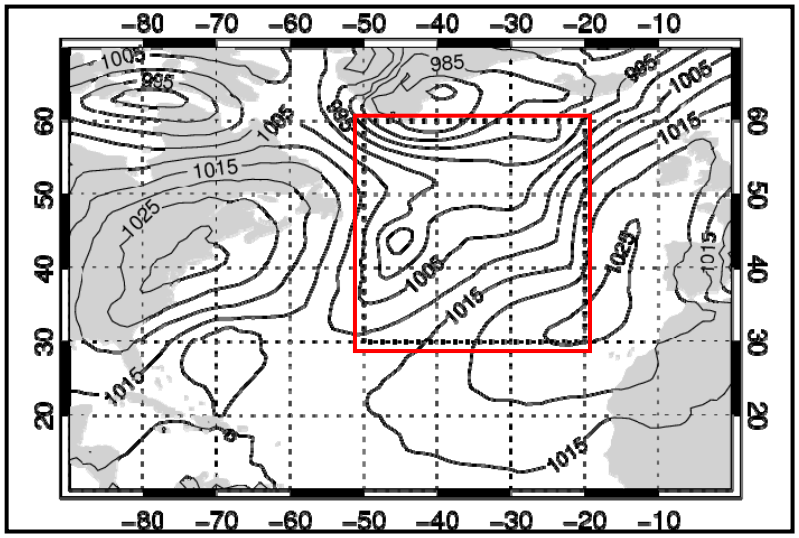
Credit Ron Gelaro, NASA

2) Impact studies on specific episodes

- Basically computes the impact for rapidly developing cyclogenesis over the ocean;
- It has the benefit of really bringing out the impact of the drifters because they are the only source of SLP able to anchor the pressure field

00Z 6th November FEC in the 30° x30°





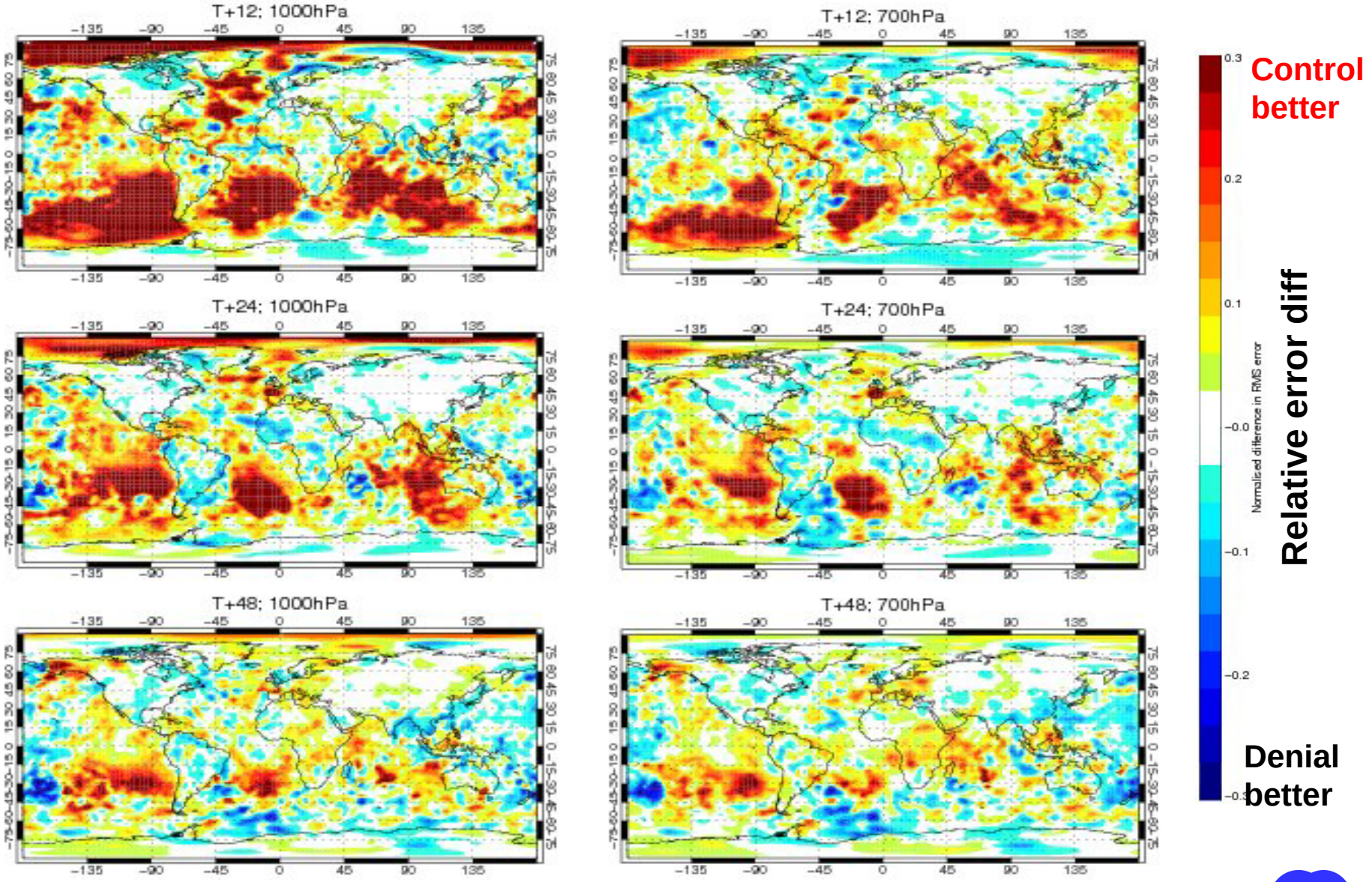
MSL pressure

3) OSE

- It is a full data denial experiment that can be used to test the full operational system and look at the effect of “thinning” the observational array

Credit Claudia Cardinali, ECMWF

Results: SP-Denial versus Control



ECMWF

Conclusions from the Workshop 1/3

- One repeated theme was the value of the adjoint approach (i.e. impact studies) vs. OSEs, and OSSEs (the latter require much bigger efforts than OSEs). Using the adjoint approach, the value of observations can be quantified quickly, with little extra effort. Some OSE efforts are underway and OSSEs can answer questions that can't be fully addressed with the adjoint and OSE approaches, such as what would be the effect of doubling the number of Southern Ocean barometer drifters.
- Several studies presented in this workshop and in the fifth WMO workshop grouped all buoys (drifting and moored) or all buoy and all ship measurements together. From the pilot project perspective, there is still the need to isolate drifter SLP data from other data buoys. This could also be done for subsets of the drifting buoy data, for example for low-latitude observations to evaluate the NWP value for following the DBCP recommendation that all drifters be outfitted with barometers.

Conclusions from the Workshop 2/3

- All studies are based on dry or wet total energy metrics, i.e. integrated over the full depth of the atmosphere. The best metrics to evaluate impact of the drifter data should be identified or at least further discussed. Should they focus on lower troposphere? It was suggested that the most straightforward approach would be to focus on surface energy: surface wind (kinetic energy), and perhaps temperature (potential energy).
- A North Atlantic case study (ECMWF) demonstrates that the drifter data makes particularly significant impacts during cyclogenesis. This result emphasizes the need to examine particular cases in other regions: globally averaged metrics don't emphasize peak events during cyclogenesis, but rather average these intermittent events with long periods of relatively quiescent weather.

Conclusions from the Workshop 3/3

- Degraded wind forecasts would also degrade wave nowcasts/forecasts, something not considered in the various presentations.
- There was an overall consensus among the attendees that the results presented at this workshop are sufficient in novelty and scope to be adaptable to a BAMS paper on this subject. A lead author, preferably from the NWP community, needs to be identified and Luca Centurioni is talking to possible candidates. A good goal for the time scale of submission would be by the end of 2012 for a variety of practical reasons associated with funding cycles and hardware procurement.
- Even if no further progress is made by next year, the results presented at this workshop already present considerable evidence of the value of SLP data from buoys, particularly high-latitude open-ocean buoys (predominantly drifters), even using a metric that doesn't focus on surface observation forecasts.

Proposed way forward for the next inter-sessional period

- It is clear that the data user don't want to comment on individual components of the observing system;
- Finalize the BAMS paper
- Invite groups that did not attend but can contribute including:

1) Naval Postgraduate School (Monterey)
2) Environment Canada
3) Australian Bureau of Metorology
4) …

Proposed way forward for the next inter-sessional period

- Run one OSE specific for drifters to simulate various “thinning” scenario
- The reason for running one OSE is to look at the actual effect on the forecast, not just the adjoint (i.e. a simplified version of the full non-linear model);
- Find out one or more center who could run OSE (e. g. Environment Canada could run regional OSE)

Proposed way forward for the next inter-sessional period

- Write a proposal to the DBCP panel to run a global OSE to look at various thinning scenarios;
- Publish the findings in a peer reviewed journal