



Summer campaigns at MUC

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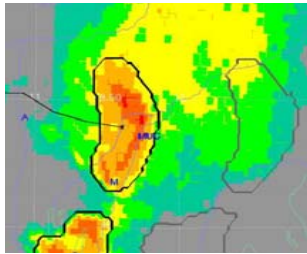
DLR – Institut für Physik der Atmosphäre (IPA)

Convection Working Group Meeting, Prague, 27-30 March 2012

Summer campaigns 2010 und 2011 at MUC Airport



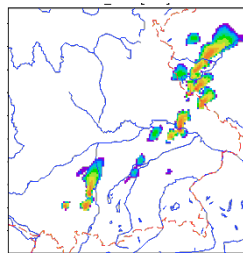
ask - Innovative Visualisierungslösungen GmbH



Cb-Nowcasting



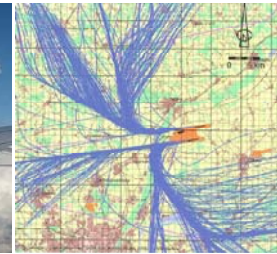
POLDIRAD



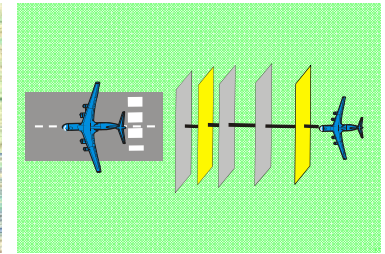
Model Forecasts
2010



Cb Warnings



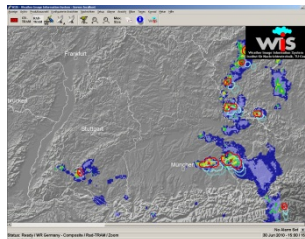
Flight Tracks
2010



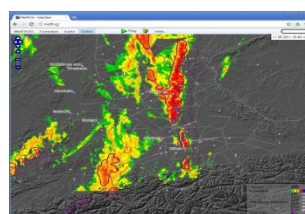
Wake Vortex Separation
2010



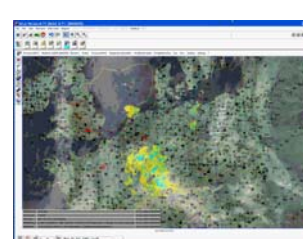
Nowcasting-Site
(DFS, DWD,
DLR, weitere)



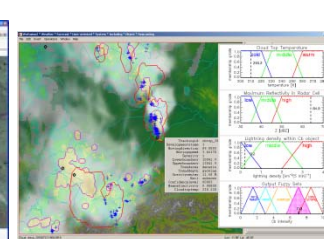
WIIS 2010
(DFS, LH HCC,
FMG)



MetFROG 2011
(DFS)



Ninjo
(DLR, DWD)



WxFUSION
(DLR)

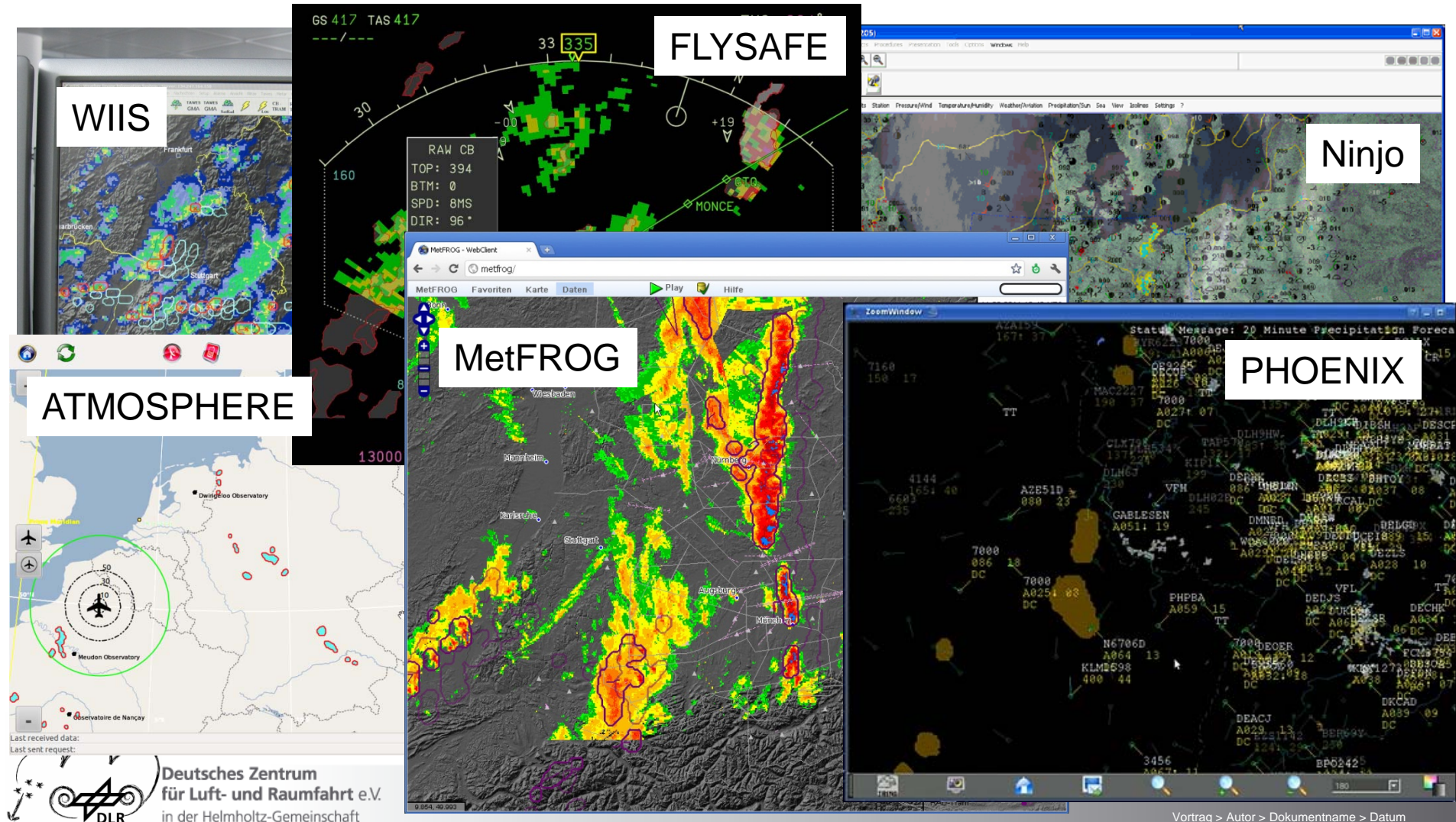


Campaign-Site
(public)



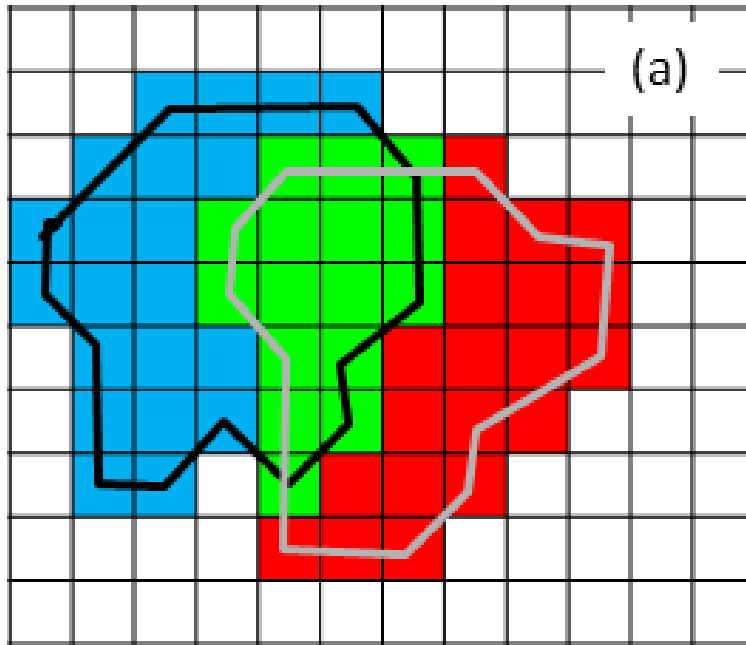
Deutsches Zentrum
für Luft- und Raumfahrt e.V.
in der Helmholtz-Gemeinschaft

Ausgabe von Objektattributen im XML-format (internat. Standard): Leicht lesbar und leicht integrierbar in weitere Systeme/Displays

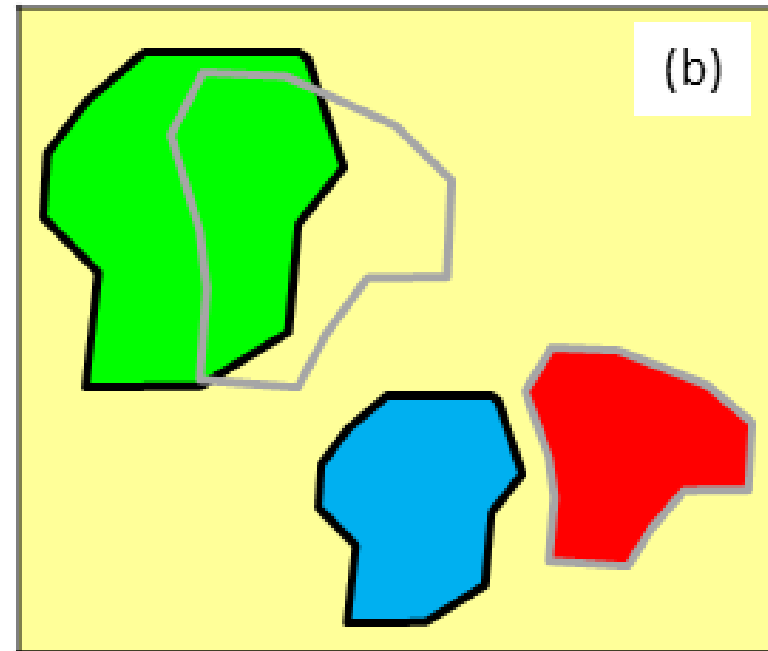


Quantitative Evaluation

Pixel-based (perfect match)



Object-based (overlap only)



$$\text{POD} = \text{hits} / (\text{hits} + \text{misses})$$

$$\text{FAR} = \text{false alarms} / (\text{hits} + \text{false alarms})$$

POD: probability of detection, FAR: false alarm ratio

Quantitative Evaluation for Rad-TRAM over 39 thunderstorm days in 2011

pixel-based	15 min.	30 min.	45 min.	60 min.
POD / FAR	0.65 / 0.36	0.47 / 0.53	0.34 / 0.65	0.27 / 0.73
POD STD / FAR STD	0.06 / 0.03	0.04 / 0.05	0.03 / 0.05	0.03 / 0.06

object-based	15 min.	30 min.	45 min.	60 min.
POD / FAR	0.74 / 0.25	0.65 / 0.35	0.56 / 0.43	0.48 / 0.52
POD STD / FAR STD	0.06 / 0.02	0.05 / 0.03	0.05 / 0.04	0.04 / 0.04

object-based for nowcast objects only	15 min.	30 min.	45 min.	60 min.
POD / FAR	0.98 / 0.01	0.95 / 0.03	0.89 / 0.09	0.75 / 0.23
POD STD / FAR STD	0.06 / 0.004	0.06 / 0.007	0.06 / 0.01	0.05 / 0.03

POD: probability of detection, FAR: false alarm ratio, STD: standard deviation

- The display is clear and intuitive
- The display of the future development is very useful
- 5 minutes updates have the advantage that rapidly developing situations can easier and earlier be assessed than with 15 minutes updates
- The nowcasting up to one hour is accurate enough to enable reasonable planning (e.g. the ordering of overtime, or the estimation of how long the airport will be affected by a thunderstorm)
- The early and precise display of the products had a positive effect on the planning (Feedback Peter Roth, DFS)

Suggestions:

- Output of cloud top height
- Forecasts up to 2 hours desired
- Display of the products in the cockpit

Outlook summer campaign 2012

an initiative supported by DLR, DWD, ProMUC, ATMOSPHERE and TriaGnoSys

Summer 2012: *first, simultaneous demonstration* of the DLR thunderstorm products for all stakeholders in the aircraft and at MUC airport (collaborative decision making, CDM in MUC)

Activities for the users at DFS, FMG and DLH:

- Thunderstorm warnings via Email
- Cb-TRAM and Rad-TRAM in DFS MetFROG
- Cb-TRAM and Rad-TRAM on the DLR Nowcasting-Seite
- Datalink into the cockpit

New in 2012:

- Automation of the thunderstorm products
- Cb-TRAM in MetFROG
- Output of thunderstorm tops
- Datalink into the cockpit (DLR HALO will participate and DLH expressed strong interest)

On-board equipment



Iridium receiver/sender



ATMOSPHERE box

Display (EFB)

communicates via LAN or wireless on-board

driven by battery

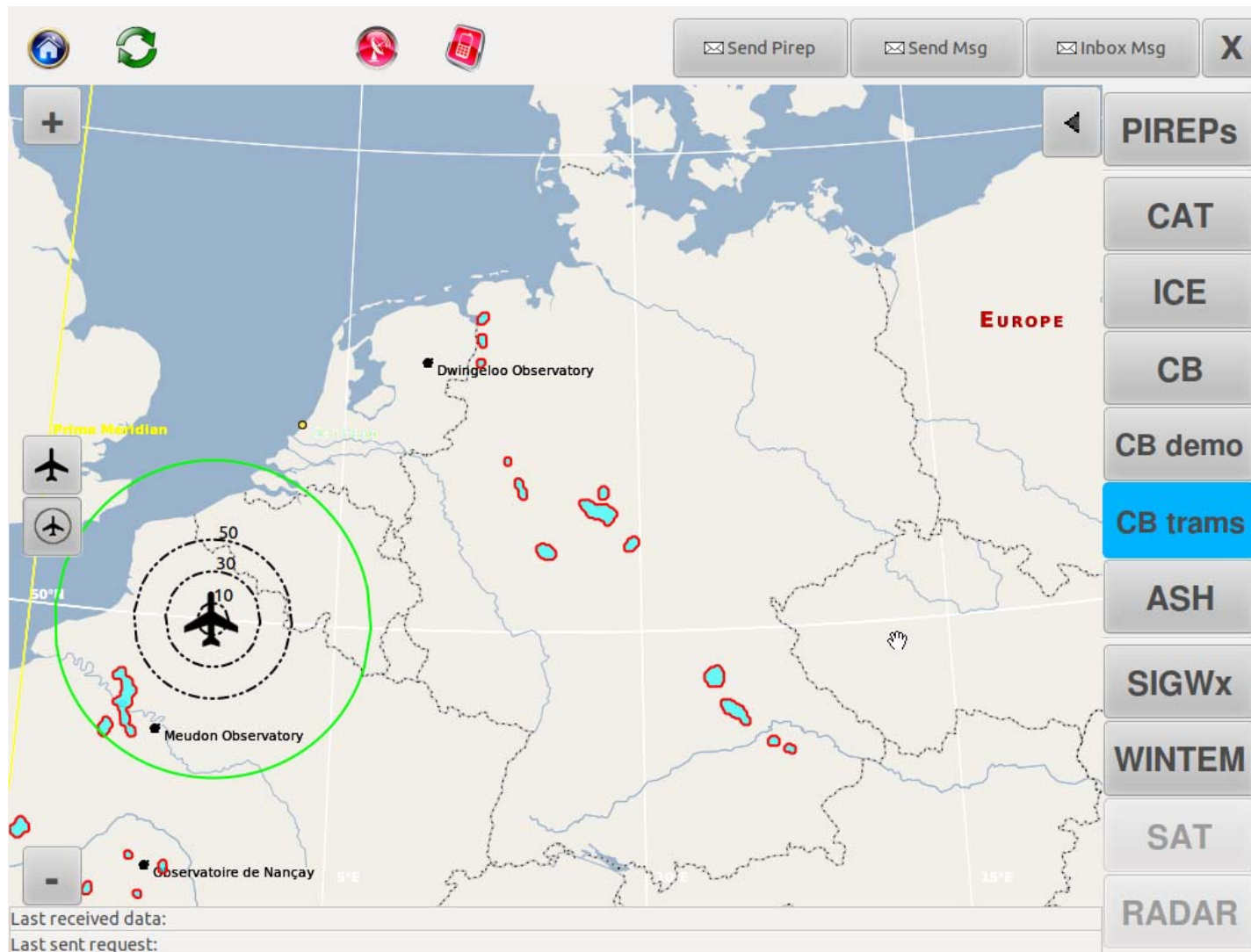
ATMOSPHERE box can be connected to the avionics (read-only) to retrieve data from on-board sensors

ATMOSPHERE box can receive data from the ground (e.g. weather data, NOTAMS)



<http://www.youtube.com/watch?v=AygpYWzonHY&lr=1>

Cb-TRAM in the ATMOSPHERE Display



Outlook summer campaign 2012



Photo: Christian Mallatun, DLR-FX



EMI-test successfully
performed on 7 March 2012



Photo: Katrin Witte, DLR-FX

Conclusions

The **DLR products** Cb-TRAM and Rad-TRAM were presented in real time to the users at MUC (DFS Center and Tower MUC, FMG, LH HCC) in displays they are familiar with

The user feedback on the DLR products was very positive

The DLR thunderstorm warnings were very helpful for the optimisation of the operations

The DLR products are appropriate to provide all users the same picture of the weather situation

They **help to improve** the **safety** and **efficiency** of air traffic

The DFS asked for a further summer campaign 2012 where the DLR products shall be provided to users both at the ground and in the air