Process studies of CI using COPS data overlays and integrated data sets

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Introduction

Advanced process studies require the integration of different observations in order to produce best estimates of 3D fields of atmospheric variables such as water vapor. Furthermore, it is essential to study different fields simultaneously. This presentation exemplarily summarizes the status of the integration of all surface-based water-vapor observations from IOP14a (06 August, 2007). These combined water vapor data are then visuallised as overlays. Surface fields, GPS integrated water vapor (IWV), Meteosat Second Generation (MSG), and radar data are presented and compared with COSMOCH-2 model output.

1. Synoptic Overview of IOP14a

A diffuse frontal zone located from the Benelux countries over central France to Spain formed the western boundary of a plume of warm air. East of this zone, a convergence line had formed, partly in response to vorticity maximum moving northeastward over France. Along the zone, surface-based convective storms formed in the afternoon.

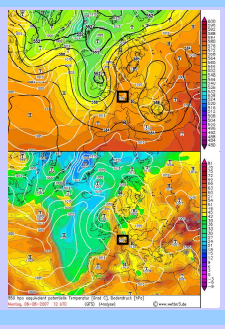

Fig. 1. Top: 500 hPa Geopotential Height, surface pressure of IOP14a (06 August, 2007) at 12UTC. Bottom: 850 hPa equivalent potential temperature and surface pressure at 12 UTC. The COPS domain is marked as the black rectangle.

2. Overlay plots

2.1. Data description for overlay plots

Table 1. Description of the data used for overlay plots

Data	Covered area	Temporal resolution (minutes)	Spatial resolution (over Germany)
Meteosat-9 (MSG2) (RSS was interrupted)	whole earth disk	15	* High Resolution Visible (HRV) channel: 1.9 /1.1 km (north-south/west-east) * The other channels: 5.7 /3.2 km (north-south/west-east)
VERA (Vienna Enhanced Resolution Analysis)	Central Europe	60	8 km
GPS IWV	Germany	15	-
Gridded IWV	Germany	15	2.8 km (same grid as DWD DX radar data)
DWD DX radar data (product of national radar composite and radar quality product composite)	Germany	5	2.8 km
Doppler On Wheels (DOWs)	-	3	0.5 km
COSMOCH-2	COPS domain	15	2.2 km

2.2. Overlay plots (DOWs)

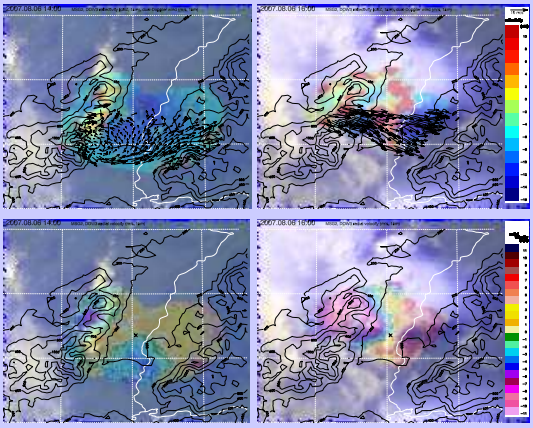

Fig. 2. Top panels: Overlay plots of MSG2, reflectivity from DOW3 and dual-Doppler wind at 14 (left), 16 UTC (right). Bottom panels: Same as top panels but radial velocity for DOW3 is shown. DOW data altitude level is 1 km above sea level. Convergence is seen along the clouds over France at 14 UTC.

2.3. Observation and COSMOCH-2

a) Precipitation and IWV

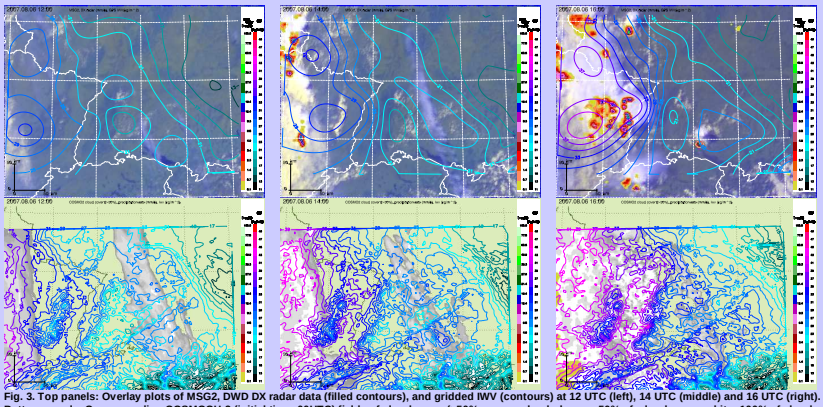

Fig. 3. Top panels: Overlay plots of MSG2, DWD DX radar data (filled contours), and gridded IWV (contours) at 12 UTC (left), 14 UTC (middle) and 16 UTC (right). Bottom panels: Corresponding COSMOCH-2 (initial time=00UTC) fields of cloud cover (>50%, grey scale; dark grey: 50% of cloud cover), precipitation rate (filled contours), and IWV (contours). Although the IWV output of COSMOCH-2 is higher than the observed IWV when clouds exist (over France), it is still strongly affected by orography.

b) Precipitation, surface wind and mixing ratio

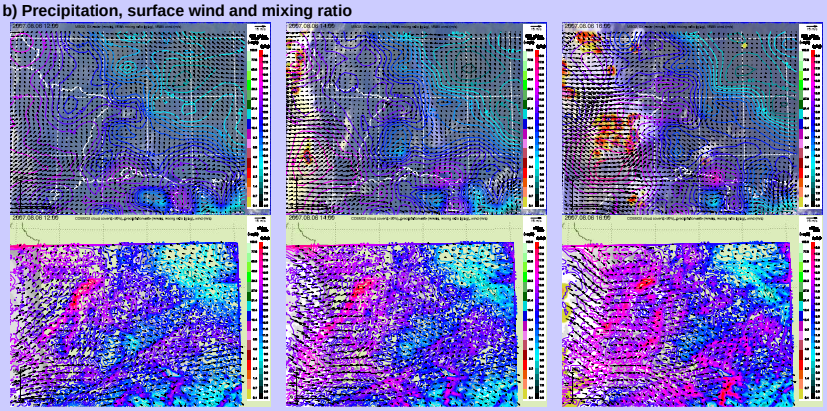

Fig. 4. Same as Fig.3. but instead of IWV, mixing ratio and surface wind are shown. Observed mixing ratio is provided by VERA.

3. Overview of surface station data

To characterise thermodynamic fields, such as water vapor, for CI studies, merging and gridding surface station data are essential. During the COPS field campaign, in addition to the operational networks, special networks were available.

Table 2. Overview table for the surface data from different networks

	Temporal resolution	Cover area	Number of stations in the COPS domain	Parameters				
				Temperature	Precipitation	Wind direction & speed	Surface pressure	Others
GTS	1 /3/ 6/12 hr	-	85	X	X	X	X	X
non GTS	10 min/1 hr/ 6 hr/12 hr/ 6, 13, 18 UTC	-	1096	X	X	X	X	X
LUBW	30 min	Lat: 47.5~49.8 Lon: 7.5~10.4	256	X	X	X	X	X
Uni. of Vienna (HOBO+MAWS+SONIC)	1 min	Lat: 48.6~48.8 Lon:8.6~8.9	107	X	X	X	X	X
IMK (met+flux)	5/10/30 min	Lat: 47.7~49.2 Lon: 7.1~8.5	14	X	X	X	X	X
Uni. of Innsbruck	1 min	Lat: 48.5~48.8 Lon:8.2~8.6	10	X	X	X	X	X
Uni. of Munich	2 min	Lat:48.5~48.7 Lon: 8.0~8.3	6	X	-	X	X	X
Uni. of Leeds	1 sec	Lat: 48.5~48.7 Lon: 8.1~8.5	13	X	-	X	X	-
Univ. of Bayreuth (met+flux+mast)	30 min	Lat: 48.2~48.4 Lon: 8.0~8.2	7	X	-	X	X	X
Univ. of Bonn	30 min	Lat: 48.6 Lon: 8.8	1	-	-	X	-	X
Meteo-France (met+flux)	1/30 min	Lat:48.5~48.7 Lon: 8.0~8.3	4	X	X	X	X	X

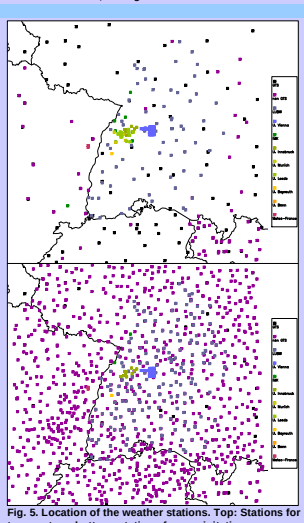

Fig. 5. Location of the weather stations. Top: Stations for temperature, bottom: stations for precipitation

Summary & Outlook

- Convergence was well observed by DOWs, GPS IWV and VERA.
- COSMOCH-2 IWV output is higher than observed IWV.
- Surface data from different networks will be gridded. →different temporal resolutions and different sensor heights have to be considered.

Acknowledgements

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