

Participants au projet et/ou à la réunion DIP-NAWDEX (21/01/19)

CNRM/ MF:

- P. Arbogast
- A. Doerenbecher
- B. Joly
- M. Wimmer
- D. Ricard
- M. Mazoyer (postdoc ANR)
- C. Lac
- B. Vié
- O. Caumont
- R. Roehrig
- J.-M. Piriou
- C. Labadie
- K. Maynard
- P. Cébron
- L. Descamps
- L. Raynaud

LMD:

- G. Rivière
- D. Flack
(postdoc ANR)
- H. Binder
(postdoc SNF)
- S. Bony
- I. Musat
- C. Claud
- J. Vial

LaMP:

- W. Wobrock
- C. Planche

LATMOS:

- J. Delanoë
- J. Pelon
- Q. Cazenave
(thèse)

LA:

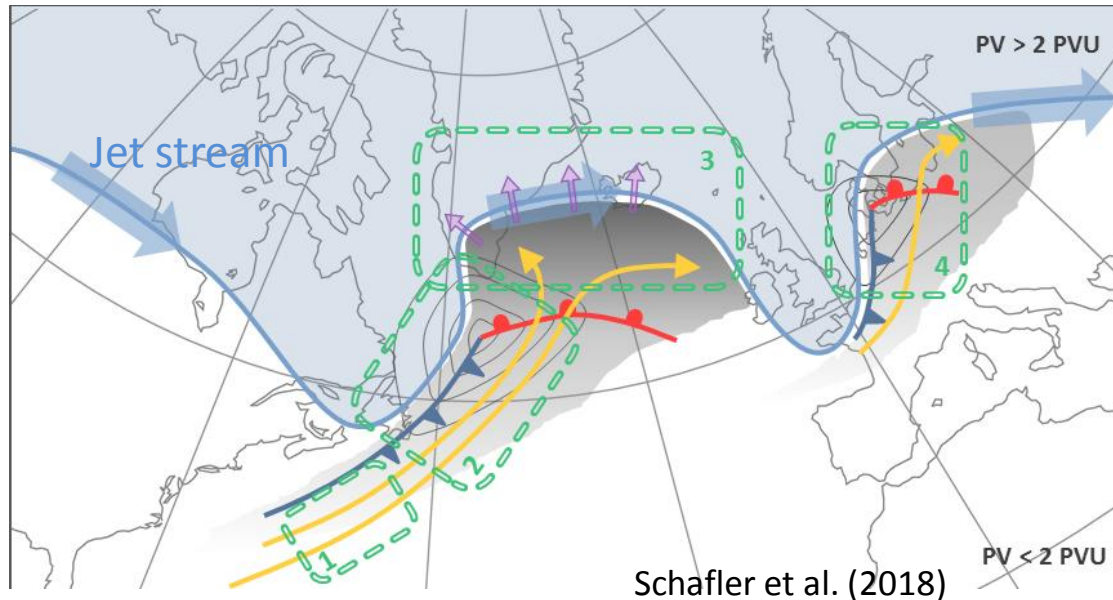
- J.-P.
Chaboureau
- N. Blanchard
(thèse)
- F. Pantillon

Lab-STICC/IGN:

- P. Bosser
- O. Bock

Hypothesis of the NAWDEX project

NAWDEX: North Atlantic Waveguide Downstream impact Experiment

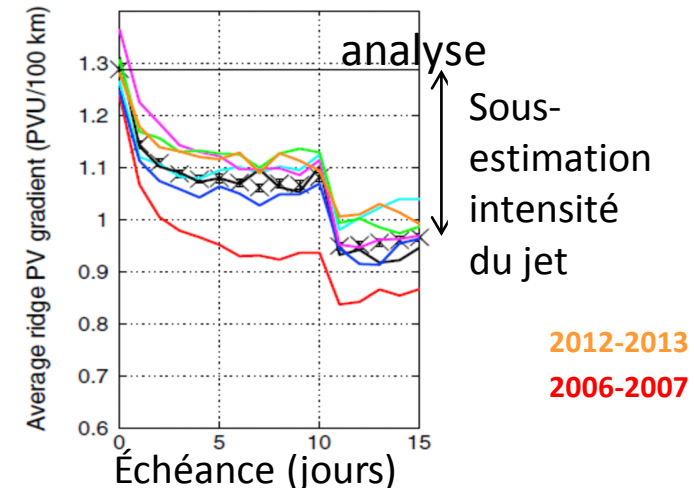


$$\frac{D}{Dt} PV = \frac{1}{\rho} \boldsymbol{\eta} \cdot \nabla \left(\frac{D}{Dt} \theta \right) \approx \frac{1}{\rho} \eta_z \frac{\partial}{\partial z} \left(\frac{D}{Dt} \theta \right)$$

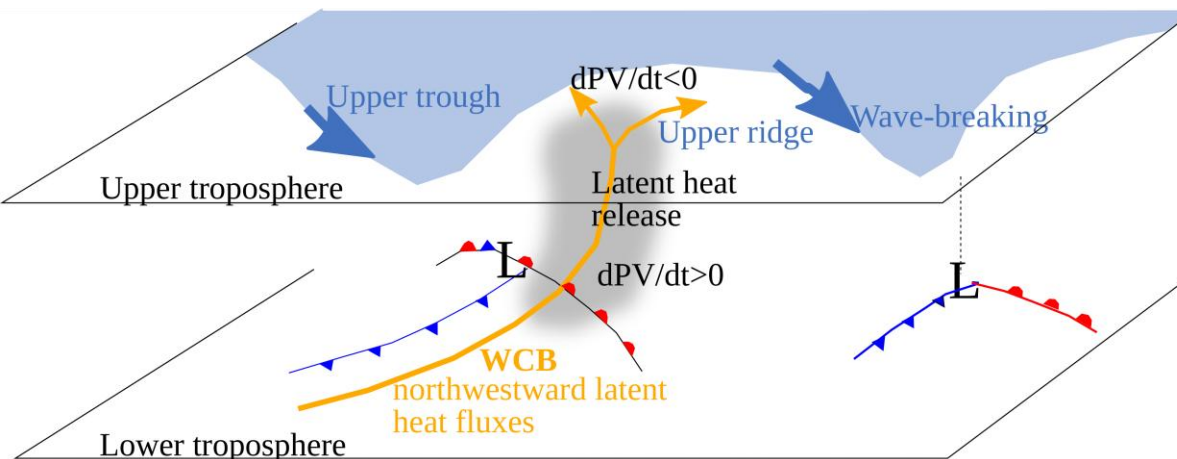
Tendance PV dépend du gradient vertical du chauffage

Prévisions ECMWF

Intensité du gradient de PV



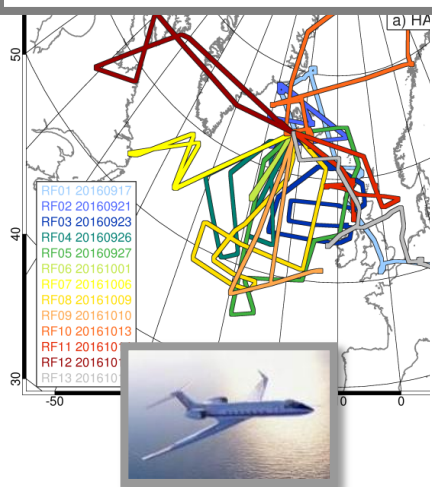
Gray et al. (2014)



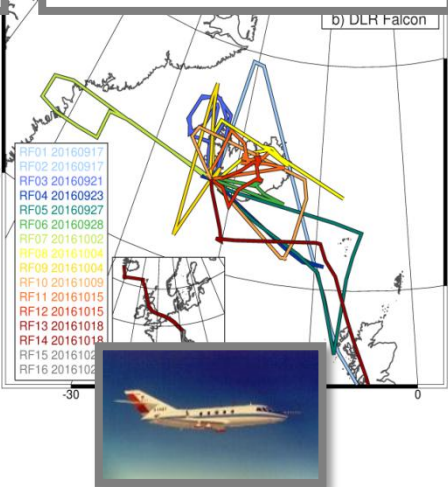
The NAWDEX field campaign (Sep-Oct 2016)

47 research flights were conducted corresponding to 205 flight hours.

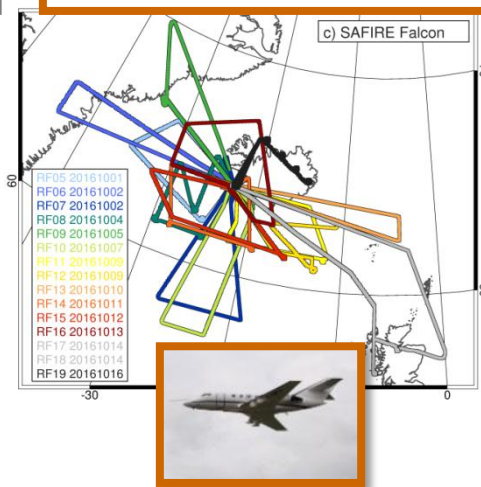
German DLR HALO



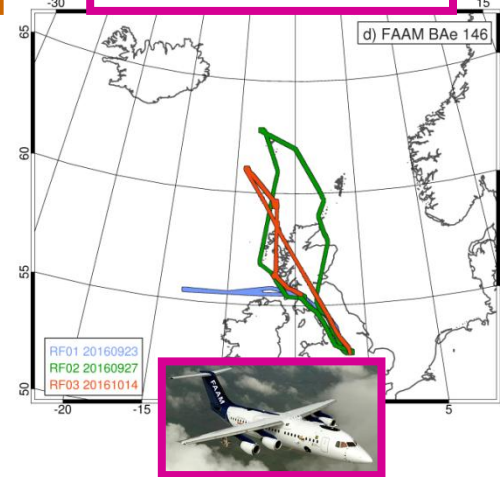
German DLR F20



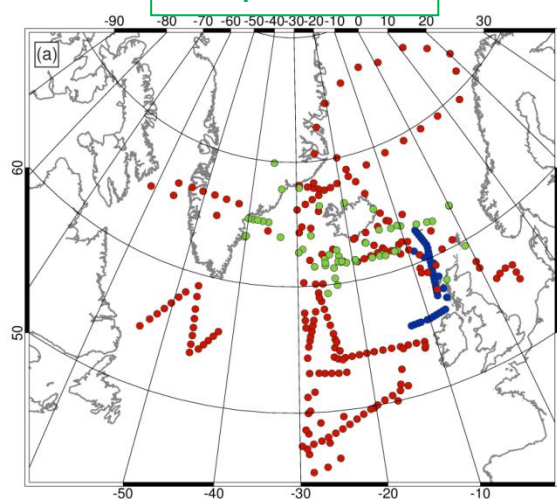
French SAFIRE F20



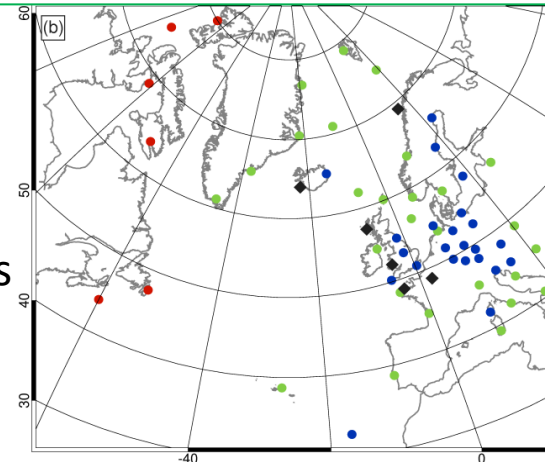
FAAM BAe 146



Dropsondes

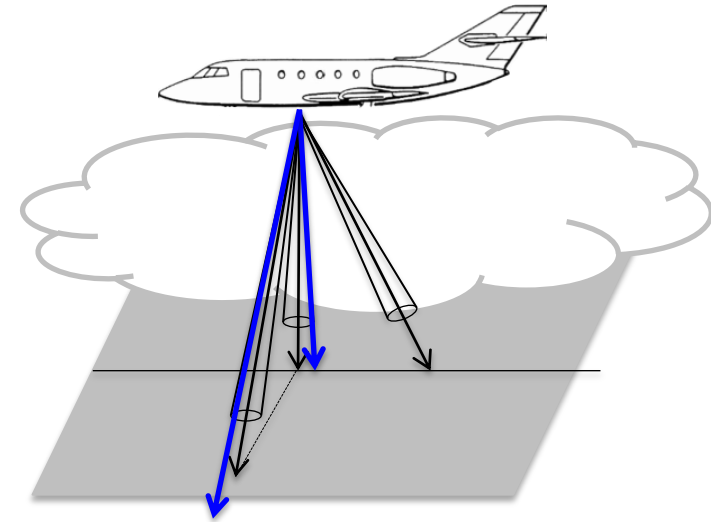


Radiosondes and ground-based obs



Composante française aéroportée

- Dates: 28 September – 17 October 2016
- Number of scientific flights: 15
- Number of scientific flight hours: 46.5
- Number of released dropsondes: 59



High spectral resolution lidar (355 nm), 532 and 1064 nm

Doppler cloud Radar (95 GHz) – 3 antennas looking down

IR radiometer CLIMAT (brightness temperature)

Dropsonde launching

Aircraft measurements

Ice water content retrieval
(variational algorithm; Delanoë
and Hogan, 2008)

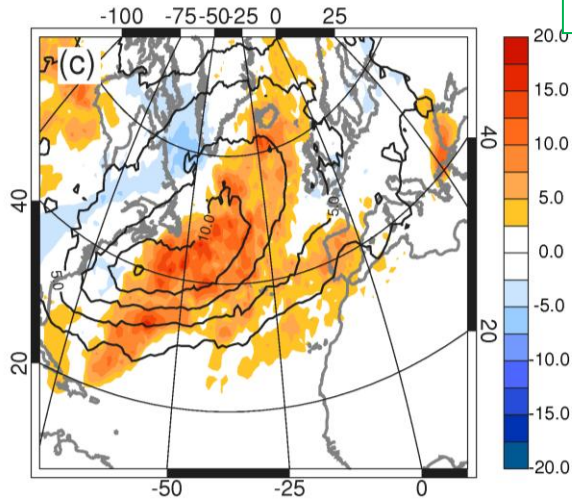
3D components of the wind

Profiles of T, p, hum, u, v

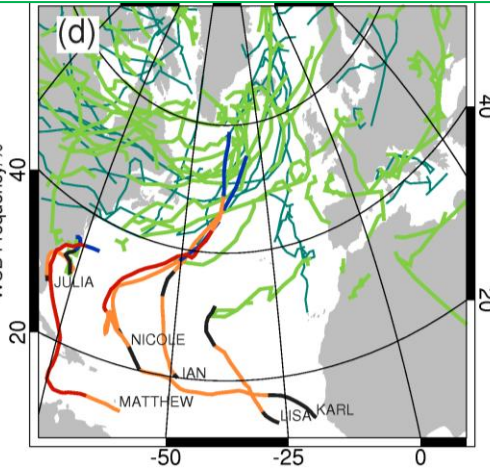
wind, T, p, hum at the altitude
of the aircraft

Situation météorologique durant NAWDEX

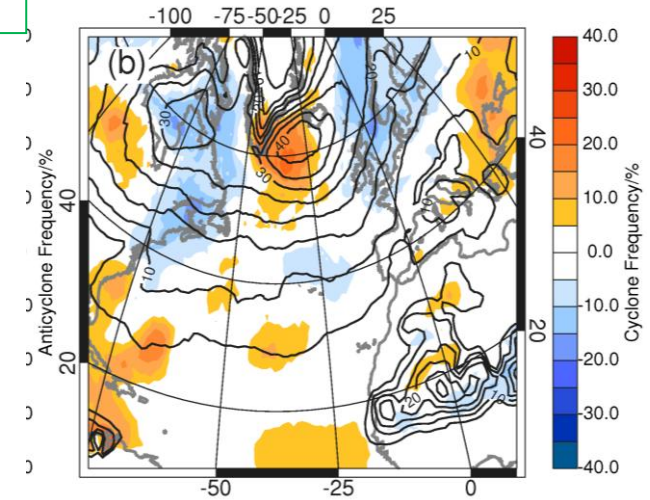
Frequencies of WCB



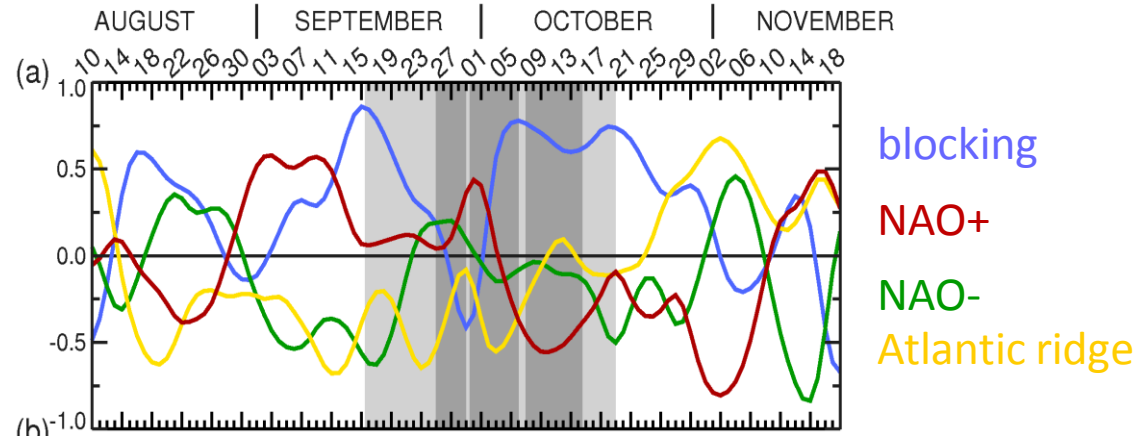
Best track of TC + other cyclone tracks



Cyclone frequencies

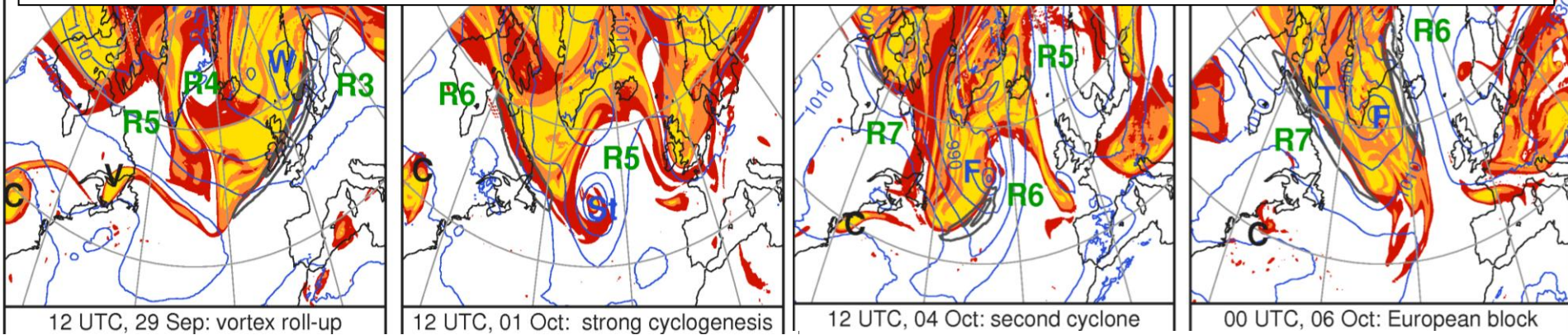


North Atlantic weather regimes indices

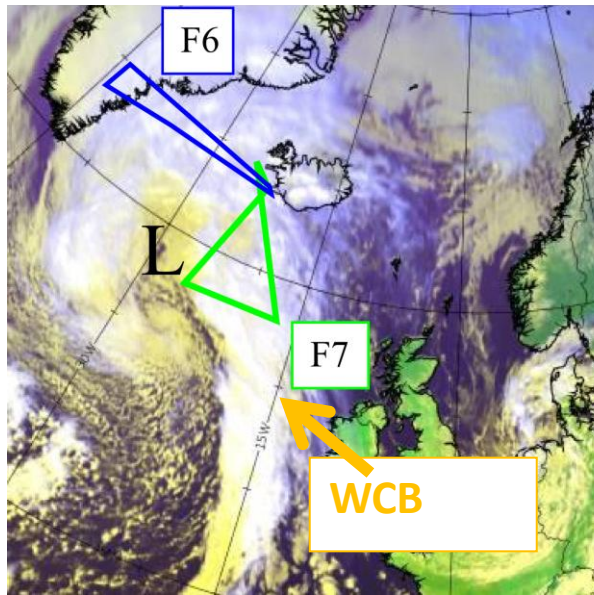


A case study: a deep cyclone leading to a blocking formation

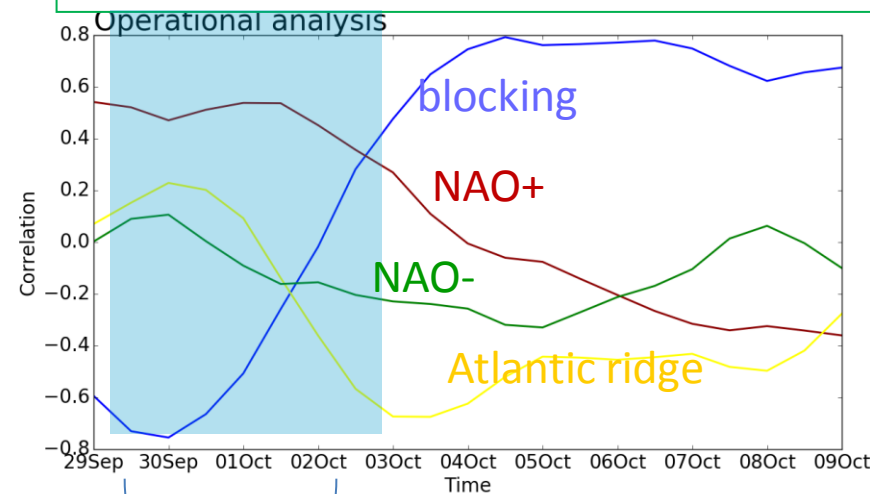
Potential vorticity in the upper troposphere ($\Theta=320\text{K}$; shadings) and SLP (contours)



Stalactite cyclone (02/10, 13UTC)



North Atlantic weather regimes indices



Stalactite cyclone life cycle

Falcon-20 flights summary

Date	Flights	Project	Description	DS	HALO	F20 DLR	BAe	Sat
01.10	f5	EPATAN	Test flight / moderate cyclone	3				
02.10	f6	EPATAN	Tropopause fold & WCB outflow	9				
	f7	EPATAN	Ascending part of the WCB	0				
03.10								
04.10	f8	EPATAN	WCB outflow & edge of the ridge building	5				
05.10	f9	EPATAN	WCB outflow. Orographic Greenland precip°	4				
06.10								
07.10	f10	NEAREX	Atmospheric river NW of a cyclone	7				
08.10								
09.10	f11	EPATAN	WCB to the southeast of Iceland	4				
	f12	EPATAN	Ascending region of the WCB	4				
10.10	f13	NEAREX	Atmospheric river east of Iceland	6				
11.10	f14	EPATAN NEAREX	Ascending region of a WCB	4				
12.10	f15	NEAREX	Atmospheric river / WCB. HIW over Iceland	8				
13.10	f16	EPATAN	Ascending region of WCB / orographic waves.	1				
14.10	f17	EPATAN	Sparse cloudy regions / 3 aircraft	1				
	f18	EPATAN	Coordinated flights	1				
15.10								
16.10	f19	EPATAN	Weak system with moist advection / Config ADM	2				

← Stalactite cyclone
← (<960 hPa)

← Frontal wave
← cyclone (~960 hPa)

← Atmospheric rivers

← WCBs and ridge
← building

← Coordinated flights

Organisation de la journée du 29/01/19

- 10h30: début / intro
- 11h-11h30: David « Stalactite Cyclone and Climate models (Arpege-Climat/LMDZ) »
- 11h30-12h: Meryl « Stalactite Cyclone & Arpege-oper/PEARP »
- 12h-12h30: Nicolas « Stalactite Cyclone & Meso-NH: impact processus diabatiques »
- 12h30-13h: Marie « Stalactite Cyclone & Meso-NH: sensibilité à 2 schémas de microphysique »
- 13h-14h: déjeuner
- 14h-14h30: Julien: « Résultats du projet EPATAN: les obs »
- 14h30-15h: Gwendal « Comparaison obs - Arpege-oper/PEARP sur ensemble des vols »
- 15h-15h30: Hanin « Cut-off Sanchez and Arpege-oper/PEARP »
- 15h30-16h: Pierre « IWV from GPS obs »
- 16h-16h30: Wolfram « microphysique paramétrée / détaillée »
- 16h30-17h30: discussion (NAWDEX workshop 26-28 Mars, publications communes à plusieurs équipes, page web, futures tâches)

Tasks

First year Second year Third year

Task 1: Observational data analysis and preparation of model-observation comparisons

- *Verification stage of the quality of the observational dataset (Julien Delanoë)*
- *Development of model-observation comparison tools (Olivier Caumont)*
- *Data assimilation of wind observations (Alexis Doerenbecher)*

Task 2: Mesoscale process studies and local effects of warm conveyor belts

- *Warm conveyor belts and cloud microphysics (Jean-Pierre Chaboureau)*
- *Warm conveyor belt outflow regions and impact of WCB on jet intensity and ridge building (Philippe Arbogast)*
- *Warm conveyor belts and turbulence (Didier Ricard)*

Task 3: Large-scale process studies and remote effects

- *Short-term climate model biases and dependance on model physics (Gwendal Rivière)*
- *Predictability of the Scandinavian blocking (Gwendal Rivière)*
- *Predictability of the HIW event in southern France on 13-14 Oct (Philippe Arbogast)*

Tasks

First year Second year Third year

Task 1: Observational data analysis and preparation of model-observation comparisons

- *Verification stage of the quality of the observational dataset (Julien)*

To be discussed:

- *DARDAR datasets (IWC retrieval from CloudSat-Calypso)*
- *Dropsondes post-processing (humidity biases)*
- *Passive microwave products (MHS/ATMS)*
- *Radiosondes datasets (Canada, Iceland, UK, France) to be compared with*

GNSS retrievals

- *Development of model-observation comparison tools (Olivier)*

To be discussed:

- *Flight track in Arpege ? Comparison with LMDZ outputs ?*
- *COSP (offline and online versions at CNRM exists for CloudSat-Calypso comparison). Comparison with the RADAR simulator developed by Borderies et al.*

- *Data assimilation of wind observations (Alexis)*

To be discussed:

- *How to assimilate radar /lidar wind observations. Collaborations with DLR colleagues to get the wind retrieval from lidar.*

Tasks

First year Second year Third year

Task 2: Mesoscale process studies and local effects of warm conveyor belts

- Warm conveyor belts and cloud microphysics (Jean-Pierre)

To be discussed:

- How to compare WRF-DESCAM, Meso-NH and RALI observations. Choice of the regional domain for WRF-DESCAM, which cases.

- Warm conveyor belt outflow regions and impact of WCB on jet intensity and ridge building (Philippe)

To be discussed:

- diabatic tendencies (DDH) from Arpege
- Do we compare Arpege with Meso-NH over a large domain covering the whole blocking event ?

- Warm conveyor belts and turbulence (Didier)

To be discussed:

- Questions from Didier to Julien ? Or Next meeting.

Tasks

First year Second year Third year

Task 3: Large-scale process studies and remote effects

- *Short-term climate model biases and dependence on model physics (Gwendal)*

To be discussed:

- *Start with the stalactite cyclone (initial conditions, resolution, zoom)*
- *Coordination T-AMIP experiments with Arpege-climat / LMDZ*

- *Predictability of the Scandinavian blocking (Gwendal)*

To be discussed:

- *the lack of blocking persistence will see new set up of EPS with SURFEX*
- *Initial conditions in humidity (near the east coast of the US)*

- *Predictability of the HIW event in southern France on 13-14 Oct (Philippe)*

To be discussed:

- *PV modification in the cut-off Sanchez (Hanin)*
- *Complementary mesoscale ensemble prediction vs Arpege ensemble prediction*
- *Use of HALO observations on Oct 9th and 10th (Hanin). Maybe Satellite overpass.*