The use of EDR to build and verify a global turbulence diagnostic

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ABO Workshop, ECMWF, Reading, UK
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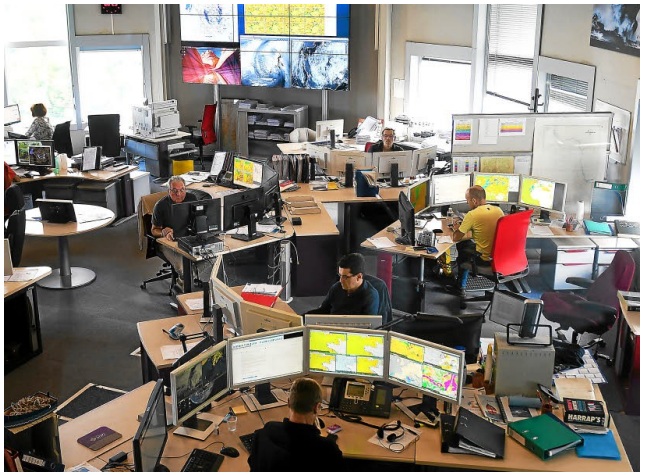
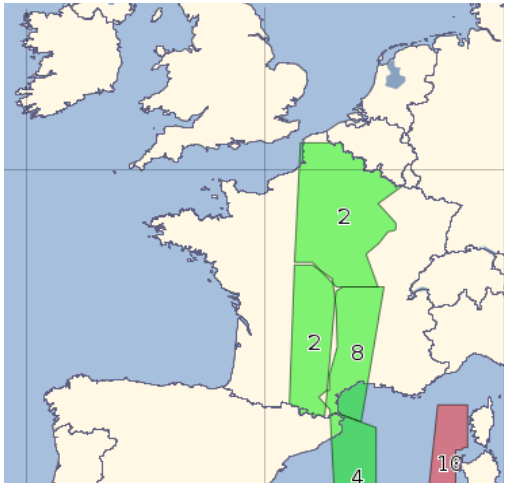
Institutional forecast activities at Météo-France

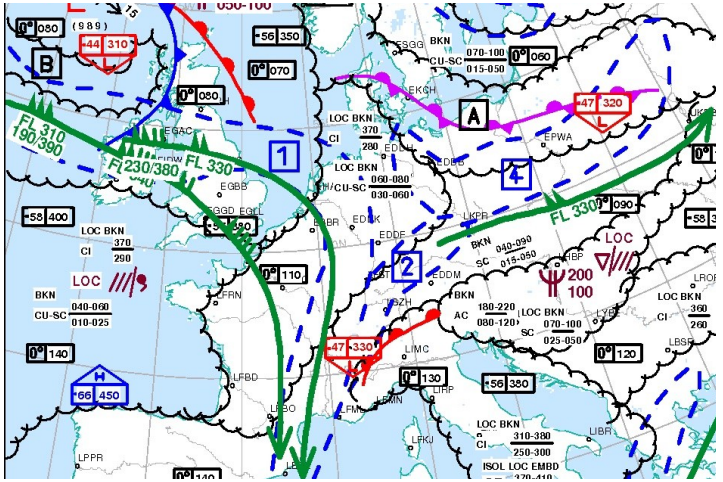
Support to air traffic control



SIGMETs for French territories including French Antilles, Polynesia,..



French and European **SIGWX charts** (3H freq)



Terminal area forecast

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LFBO 111700Z
1118/1224
28012KT CAVOK
BECMG 1200/1202
BKN013 PROB40
TEMPO 1201/1207
BKN009 BECMG
1207/1210 SCT035
BECMG 1210/1212
CAVOK=
```

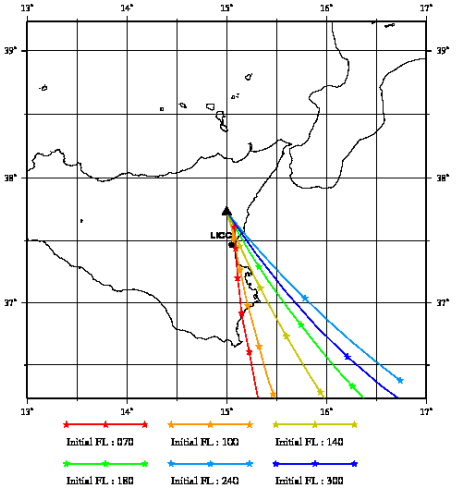
Airports

- METAR, OBSMET TEND, TAF, PREDEC
- Avertissements MAA
- *LVP, CDM@...*
- *ASPOC*

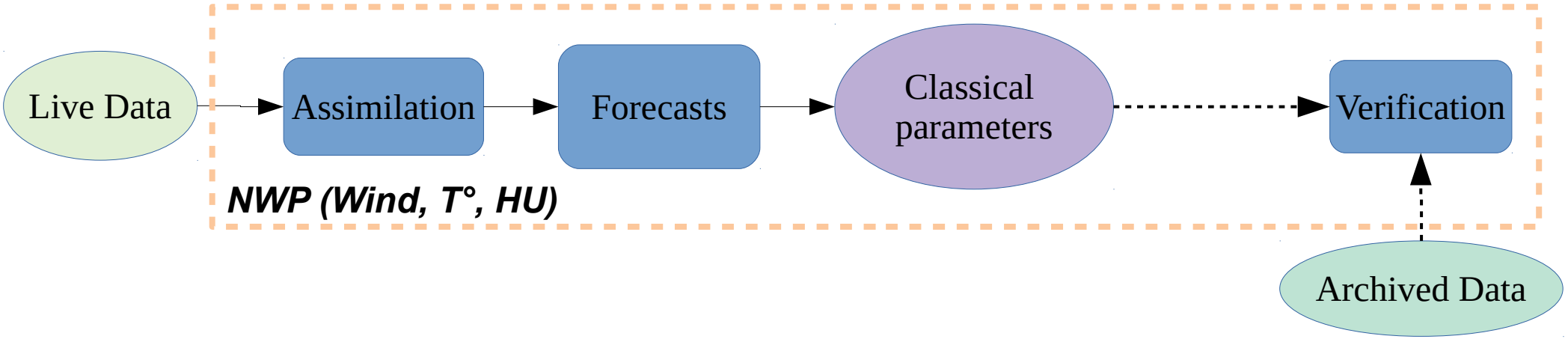
Volcanic Ash Adivsory Center

The nine VAACs (Volcanic Ash Advisory Centers), have been designated by the International Civil Aviation Organization to provide their expertise to civil aviation in case of significant volcanic eruptions. They are a basic part of the IAVW. (International Airways Volcano Watch).

Clickable Map of Areas of Responsibility for the nine VAACs



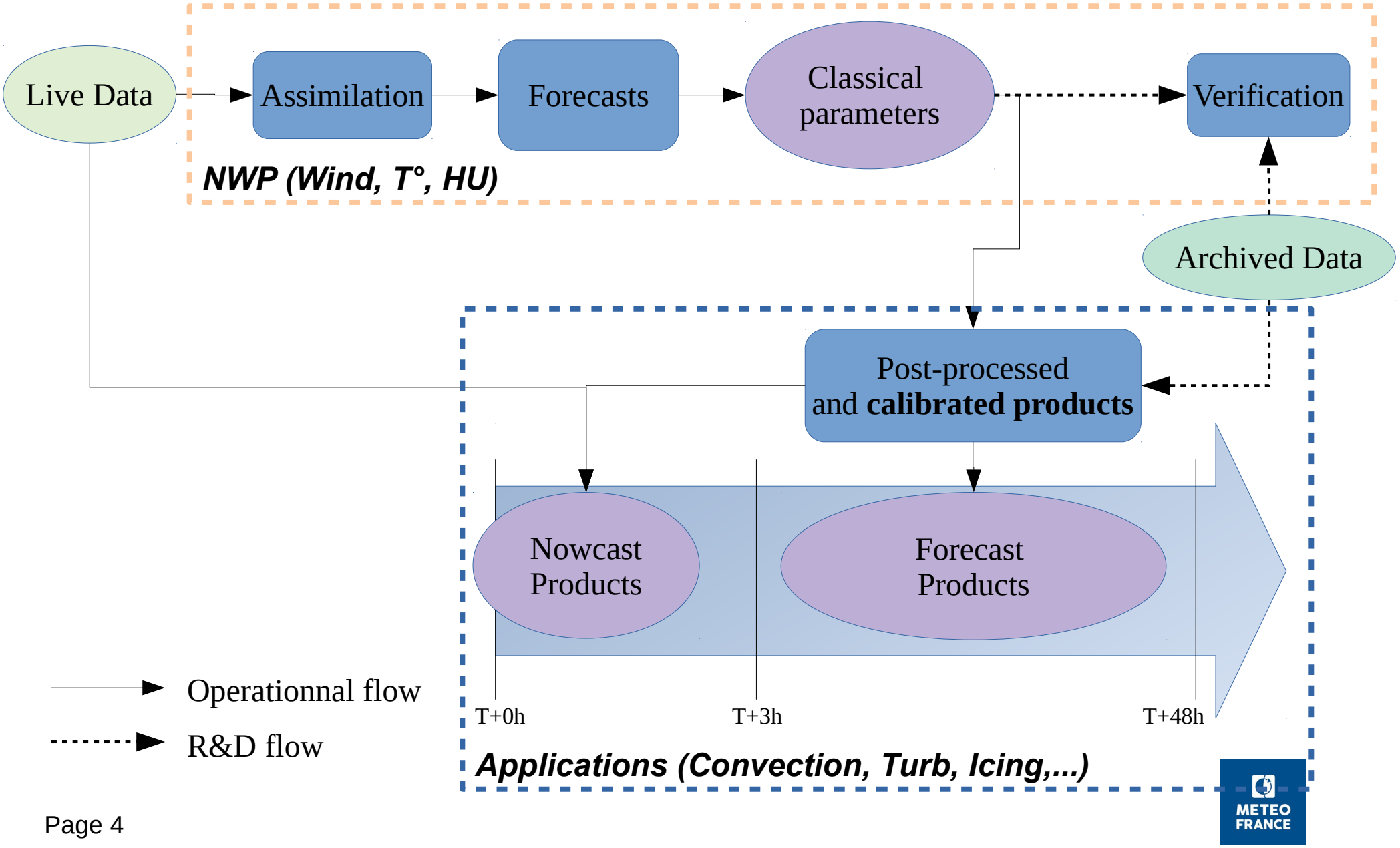
Use of Data for Aeronautical Forecast Products



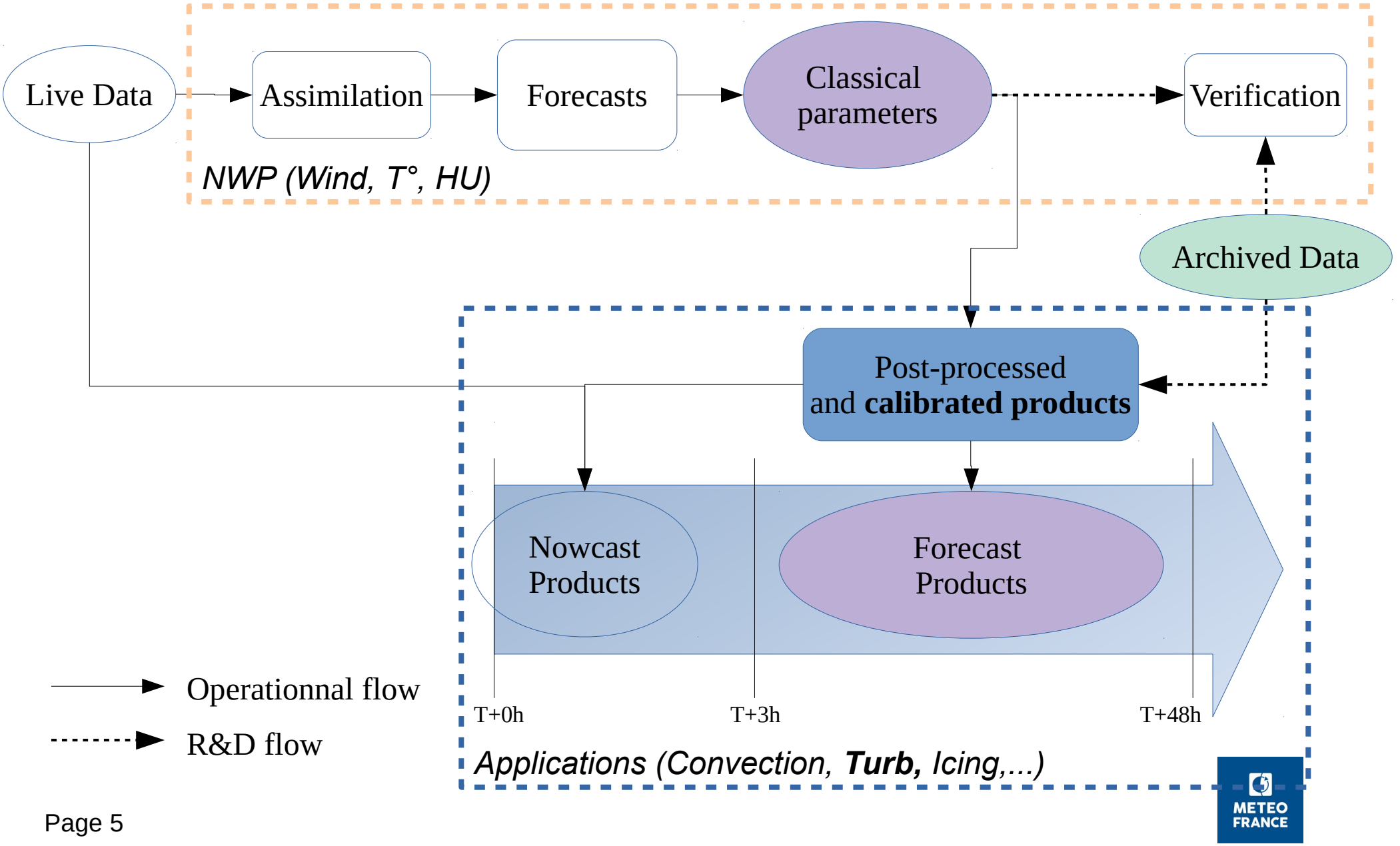
Operationnal flow

R&D flow

Use of Data for Aeronautical Forecast Products



Use of Data for Aeronautical Forecast Products



Aviation Turbulence Classifications

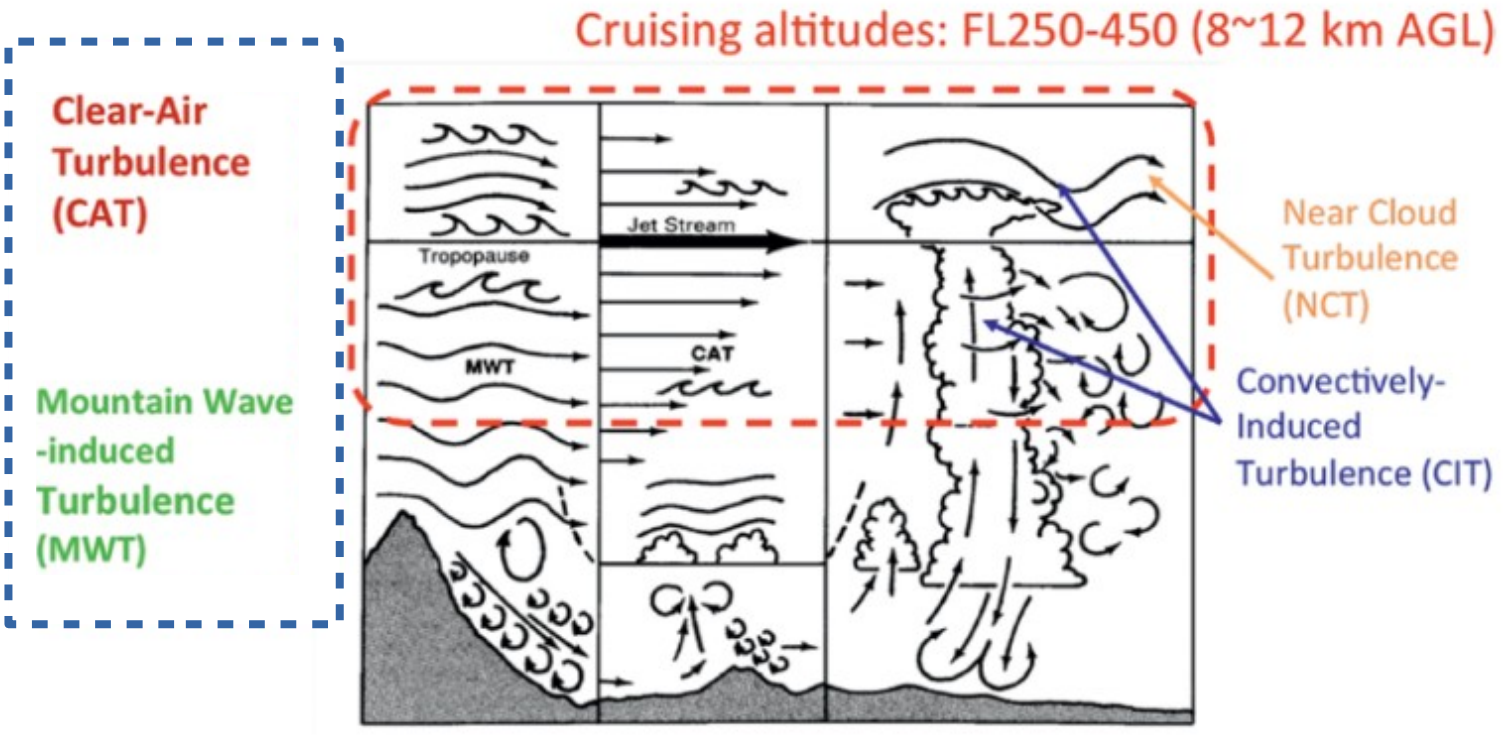
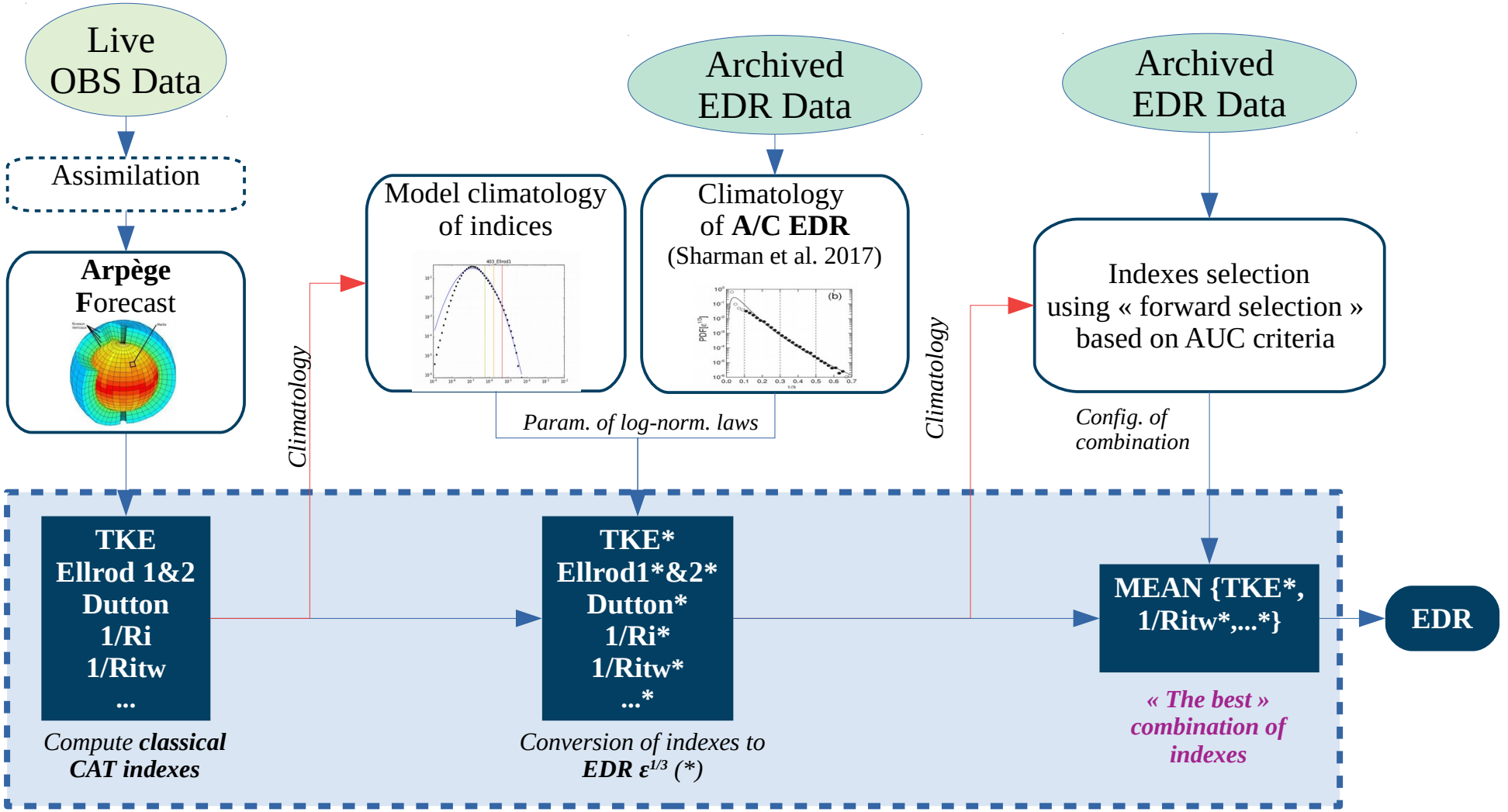


FIG. 1. Aviation turbulence classifications, representing a pictorial summary of turbulence phenomena that may occur in each turbulence classification [adapted from Lester (1994); Jeppesen Sanderson, Inc.].

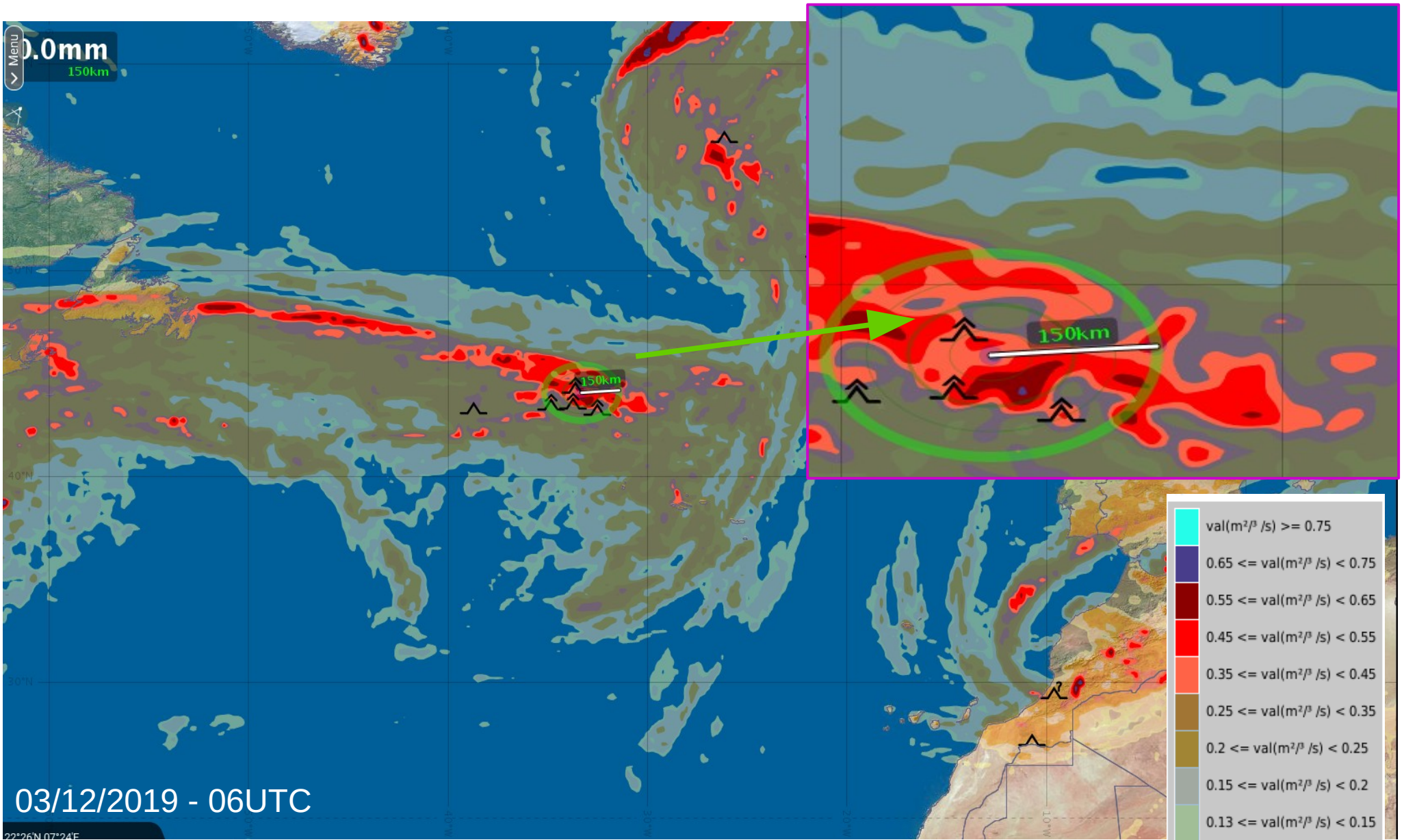
Kim et Al. 2018

EDR diagnostic :
A combination of indexes using EDR data

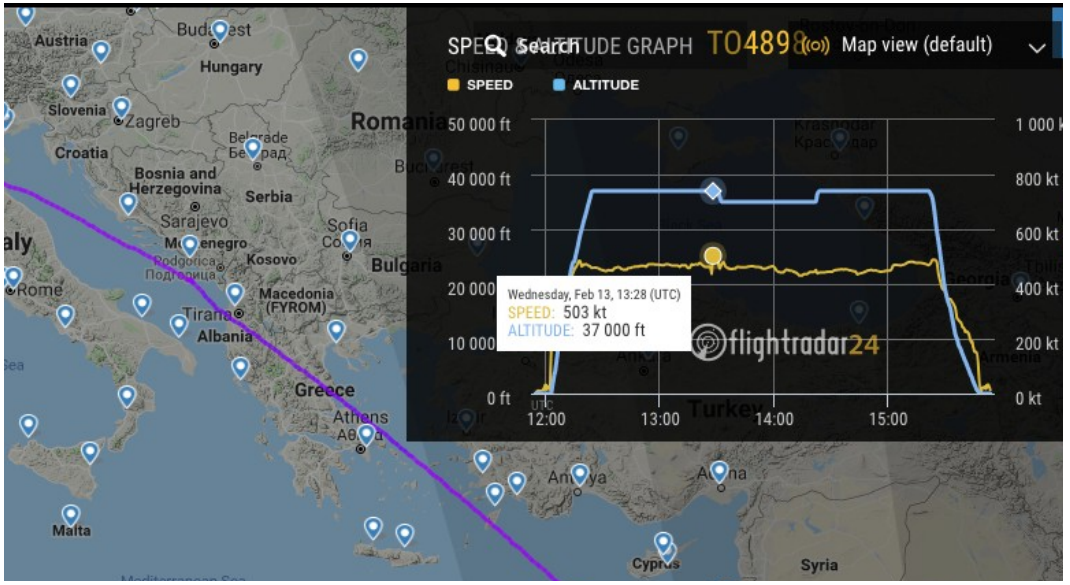


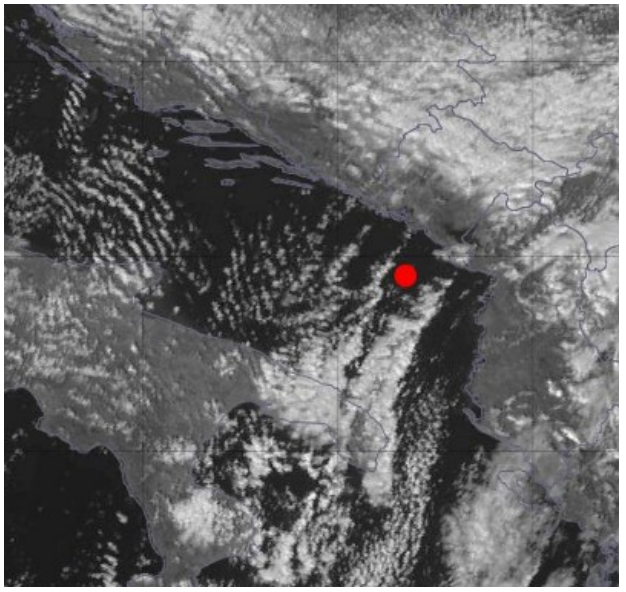
Méthode GTG (Graphical Turbulence Guidance - Sharman et al. 2006, Sharman et al. 2017)

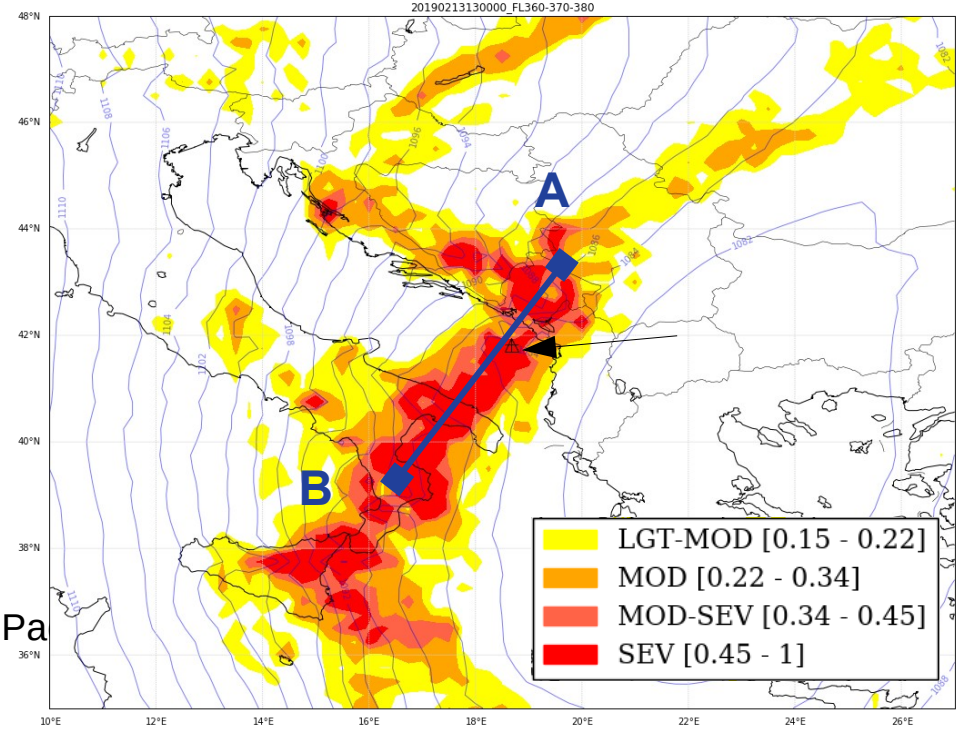
Case study : CAT in Jet stream

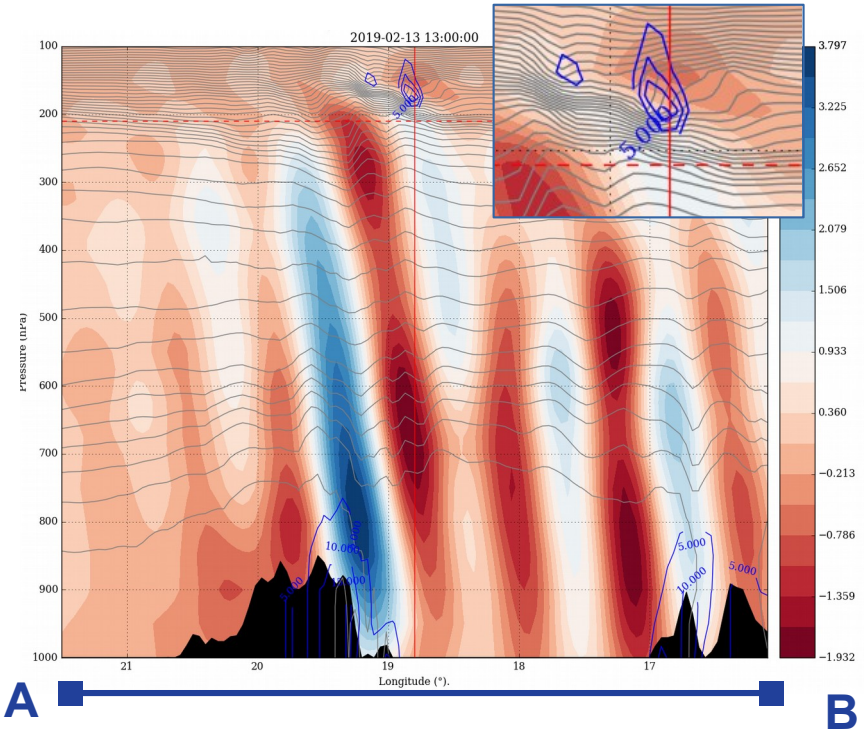


Case study : Severe Mountain Waves @ FL 380



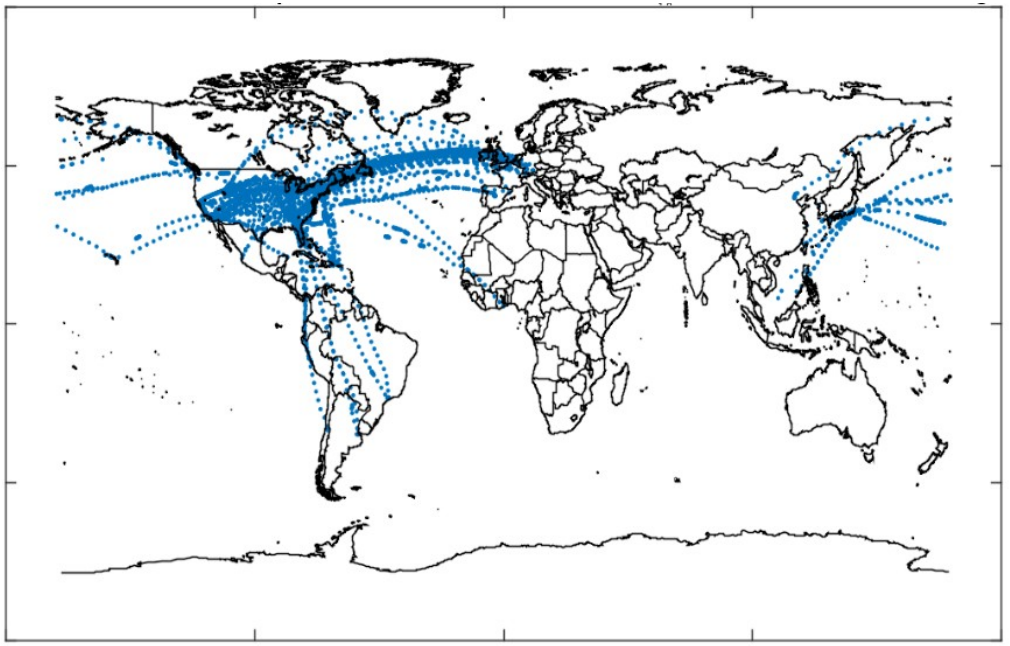




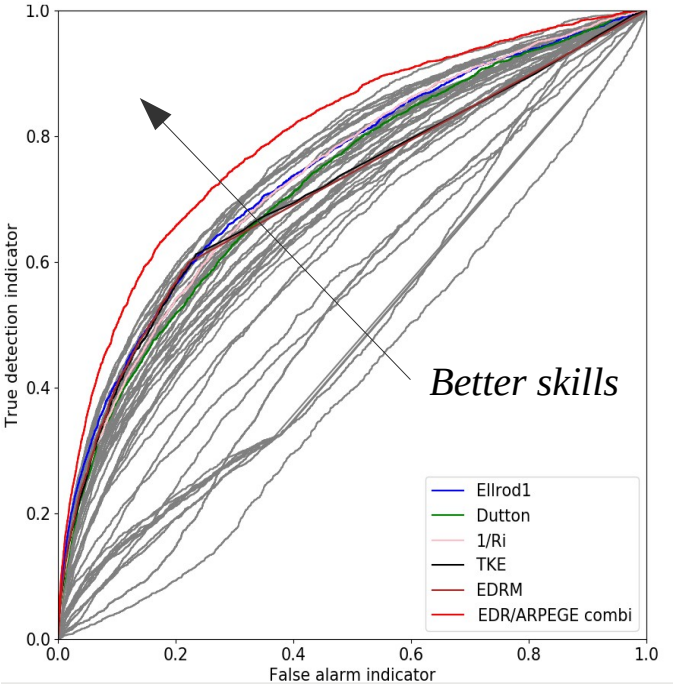


Verification

EDR for a 24h period on 2017-03-31



Verification vs traditional diagnostics



*Verification with an **independent EDR dataset.***

- Common verification method based on AUC (NCAR - *Sharman et al. 2017)*
- New EDR product show better skills than any individual diagnostic

Needs to improve forecasts

- Homogeneous widespread observations of EDR
  - Need standard algorithm for in-situ EDR (on board): data should have the same climatology to be used together
  - Need metadata (type of A/C, algo, companies?)
  - Accurate spatial and temporal resolution (ex with DEVG : a 10-min segment associated with one data is too long!)
- Fast transmission

Future: Nowcasting

- Dataset is too big to be displayed
- Need merging method
- High refresh rate
- Better capture of low predictability phenomena (e.g. Convect. Induced Turbulence)
- **Requiers a lot of in-situ EDR data**