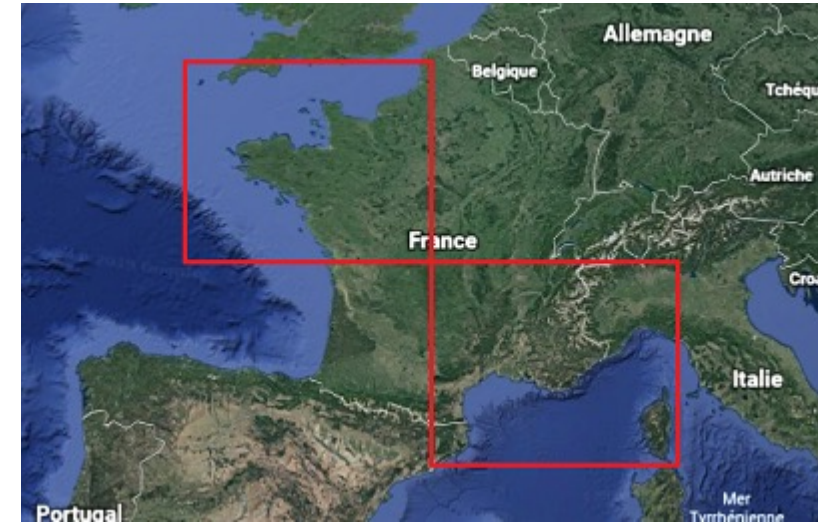# Deep Learning and Geophysical Systems

Project proposal - MeteoNet

# MeteoNet presentation

- Open Weather dataset from Meteo France

- 3 years of data

- Various data sources

- Data challenges on Kaggle

- Toolbox and visualisation tools on github



- https://meteonet.umr-cnrm.fr/dataset/

- https://www.kaggle.com/katerpillar/meteonet

- https://github.com/meteofrance/meteonet

# Dataset

| Data Type | Size for NW zone (GB) | Size for SE zone (GB) | Total Size (GB) | Path (example for the NW zone) |
|---|---|---|---|---|
| Ground Observation | 0.5 | 2.5 | 3.0 | /data/NW/ground_stations/ |
| Rain Radar | 5.8 | 6.5 | 12.3 | /data/NW/radar/rainfall/ |
| Rain Radar Quality Code | 19.6 | 31 | 50.6 | /data/NW/radar/rainfall_quality_code/ |
| Reflectivity (new product) | 13.5 | 20.0 | 33.5 | /data/NW/radar/reflectivity_new_product/ |
| Reflectivity (old product) | 3.9 | 4.0 | 7.9 | /data/NW/radar/reflectivity_old_product/ |
| Weather models 2D | 25.8 | 23.0 | 48.8 | /data/NW/weather_models/2D_parameters/ |
| Weather models 3D | 7.8 | 8.0 | 15.8 | /data/NW/weather_models/3D_parameters/ |
| Satellite data (CT and 4 channels) | 24 | 22.8 | 46.8 | /data/NW/satellite/ |
| Masks | 0.0004 | 0.0004 | 0.001 | /data/NW/masks/ |
| TOTAL | 100.9 | 117.8 | 218.7 | |

Hundreds of stations, wind speed, direction, precipitation, humidity, Dew point, Temperature, Pressure, **every 6 min**

5 minutes resolution, comes with radar quality code (uncertainty of the measurement) – cumulative rainfall

Precipitation intensity (reflectivity dBZ)

AROME & ARPEGE midnight runs, forecast +1h - +24h

Infrared, visible, cloud cover, cloud type data, water vapor
**Pb with parallax**

# MeteoNet proposed challenges

**Time series forecasting :**
- Using past data
- Using ground stations data
- 2D models, radar data

→ Wind power production and O&M

How to complement Numerical Weather Prediction models on short time scale using Deep Learning ?
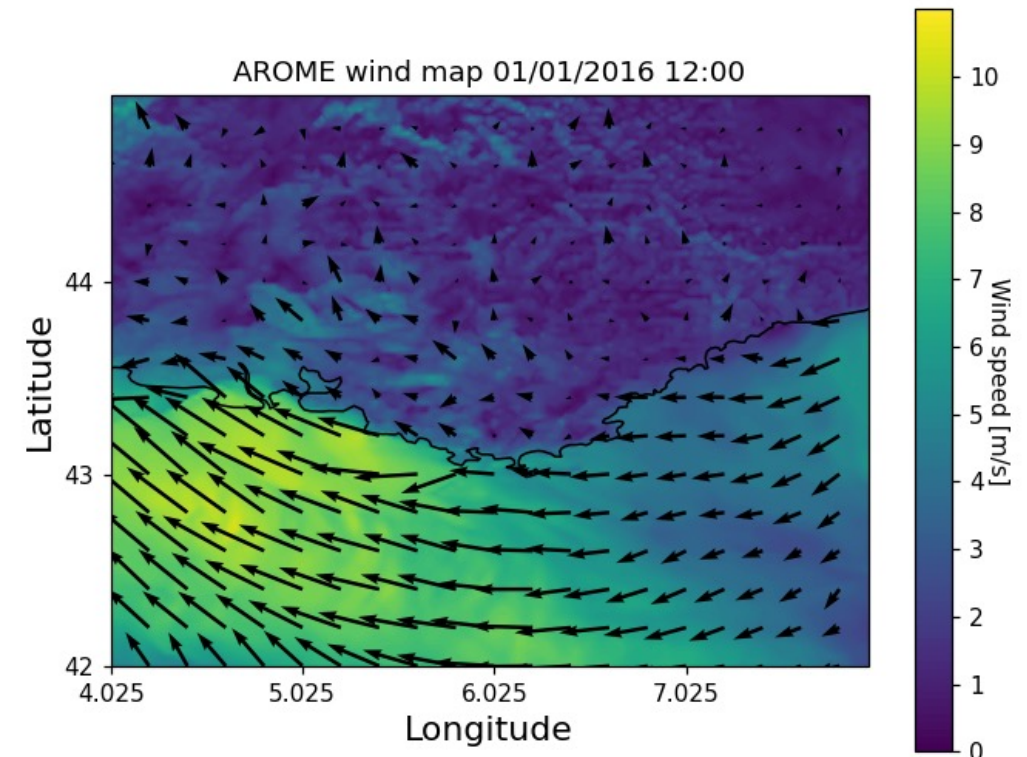
Input

- Ground stations
- NWP data
- Radar / Satellite

Reference methods

LSTM
RNN
...

Output

- Wind time series t + 6min → t + 6h

A Review On The Hybrid Approaches For Wind Speed Forecasting – Vidya et. al. 2019


AROME wind map 01/01/2016 12:00

# MeteoNet proposed challenges

**Cloud cover nowcasting**

- Satellite cloud index
- Radar data
- Infrared
- Water vapor
- Visible

→

- Satellites line of sight
- Solar power prouction

How to use satelite products for cloud nowcasting ? Can it beat NWP model ?

Input

Reference methods

Output

- Satellite cloud index
- (Satellite water column
- Satellite visible
- Satellite IR
- Radar)

CNN U-Net

- Spatio-temporal cloud coverage

Cloud Cover Nowcasting with Deep Learning – Berthomier et. Al. arXiv 2020

Binary cloud data - SE area - 2016-01-06T06:00:00.000000000

No cloud
Cloud