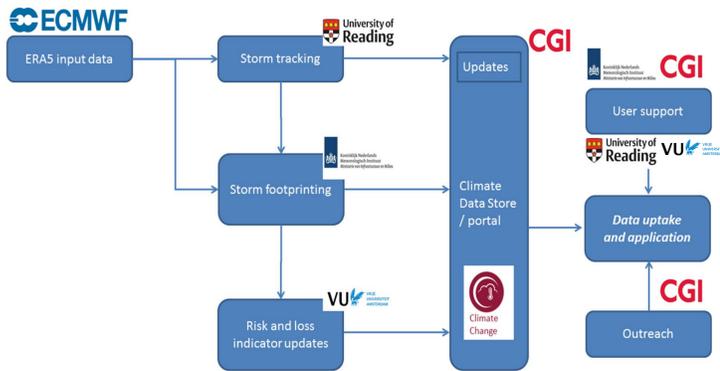


Operational Wind Storm Service for the Insurance Sector

C3S_426Lot2



The aim of the Operational Wind Storm Service for the Insurance Sector is to provide new data resources for the insurance sector that can be used to enhance the understanding of the nature of windstorms over the European continent. The main target group is insurers, reinsurers and insurance industry service providers who are interested in developing, running and analysing risk models. The information provided by this Sectoral Information Service can also support planning for the impacts of climate change in other sectors such as energy, transport, civil engineering and government.

The service aims to bridge the gap between institutions that provide climate data and the modellers and decision makers within the insurance sector. It will support users by maintaining the products produced by WISC (Wind storm Information Service – Copernicus), building on these by adding new storm tracks and footprints as these events occur, developing the retrospective library of storms from new reanalysis data and enhancing the Tier 3 indicators. This new operational service builds on the WISC Proof of Concept and will be made accessible through the Copernicus Data Store (CDS)

Storm tracking algorithm; Hodges (1995, 1999)

- Storms are identified and tracked using the 850hPa relative vorticities at T42 resolution and at 3 hourly intervals.
- Extra-Tropical Cyclones (cyclones north of 30N at any point) identification and tracking has the following steps:
 - Identify off-grid vorticity maxima above a threshold ($1.0 \times 10^{-5} \text{ s}^{-1}$) on a polar stereographic projection;
 - Initialize tracks using nearest neighbour search;
 - Refine tracks by minimising a cost function for track smoothness subject to adaptive constraints on displacement distance and smoothness;
 - Retain tracks that last longer than 2 day;
 - MSLP, maximum 925 hPa and 10-m wind speeds are added to the tracks in post processing by searching within 5 degrees radius (geodesic) of the vorticity center for MSLP minima, 6 degrees for wind maxima and 3 degrees for wind maxima only over Europe (land). All data are provided with corresponding latitude/longitude information.



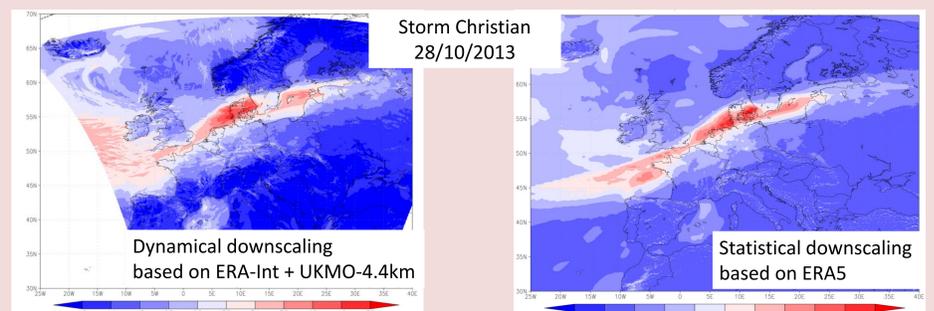
Storm tracks for Daria, showing the path of maximum vorticity in white and the minimum mean sea level pressure in blue.

Selected threshold values are based on storms expected to represent an insurance risk.

Corresponding storms have been selected for downscaling and storm footprinting.

Storm footprinting

Storm footprints represent maximum 3-second gust speeds in m/s over a 72-hour period at each model grid point for each significant winter storm. For WISC this was achieved through dynamical downscaling, using the UK Met Office unified model (Davies et al., 2005) operating at 4.4km grid, starting from ECMWF reanalysis ERA-Interim. Instead, the operational service applies statistical downscaling starting from ERA5.



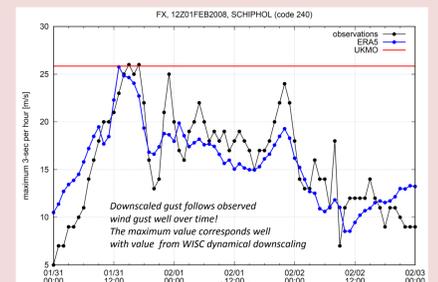
Statistical downscaling

Wind gust calculation from standard turbulence theory:

$$\langle U(z)_{max} \rangle = \overline{U(z)} + \alpha \frac{U(z_2) - U(z_1)}{\ln(z_2) - \ln(z_1)}$$

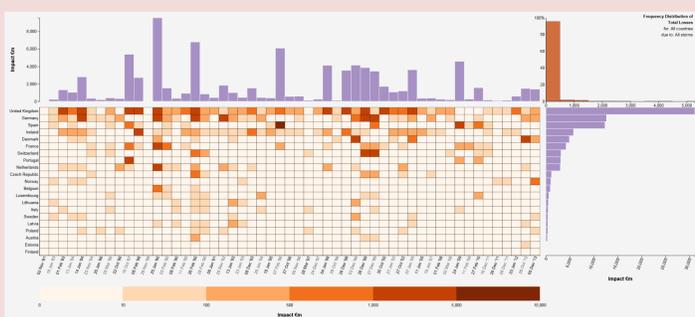
$\langle U_{max} \rangle$: the maximum 3s gust
 $\overline{U(z)}$: the average wind at height z
 α : derived physical quantity

making use of orography at 1 km grid plus a linear regression technique using ERA5 gust



Risk and loss indicators

Interactive visualisation of economic losses estimated using the footprints of the most extreme windstorms to hit Europe between 1979 and 2018. The purpose of these data is to provide consistent loss estimates across all the storms, using an open method, based on Open Streetmap (OSM)



Loss estimates from the open source tool allow insurers, re-insurers and insurance industry service providers to compare against their own risk models.

Climate Data Store - CDS

- Portal to access all data; currently under development; integration from WISC to CDS is ongoing
- WISC portal is still accessible through <https://wisc.climate.copernicus.eu/wisc/#/>

The CDS will provide access to

- The storm tracks
- Storm footprints
- Economic loss estimations

In addition the CDS provides tools to manipulate data and save results



Outreach and technical support

- WISC (Proof of Concept SIS) data in use with Insurance Community
 - WISC data still available from portal, including upgraded event set, alongside new ERA5 data
- Presenting operational project at key user meetings and user fora:
 - European Windstorm Workshop, Karlsruhe, October 2018
 - User workshop planned in London Spring 2019 to cover all Windstorm SIS products
- Continuing user support service to respond to queries about the data and how they can be used.

References

Hodges, K. I. (1995) Feature tracking on the unit-sphere. Monthly Weather Review, 123 (12): 3458-3465. doi:10.1175/1520-0493(1995)123; Davies T., M. J. P. Cullen, A. J. Malcolm, M. H. Mawson, A. Staniforth, A. A. White, & N. Wood (2005). A new dynamical core for the Met Office's global and regional modelling of the atmosphere. Q. J. R. Meteorol. Soc. 131(608), 1759-1782, April 2005