Climate Local Information in the Mediterranean region Responding to User Needs

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The FP7 project CLIM-RUN: determining users' needs

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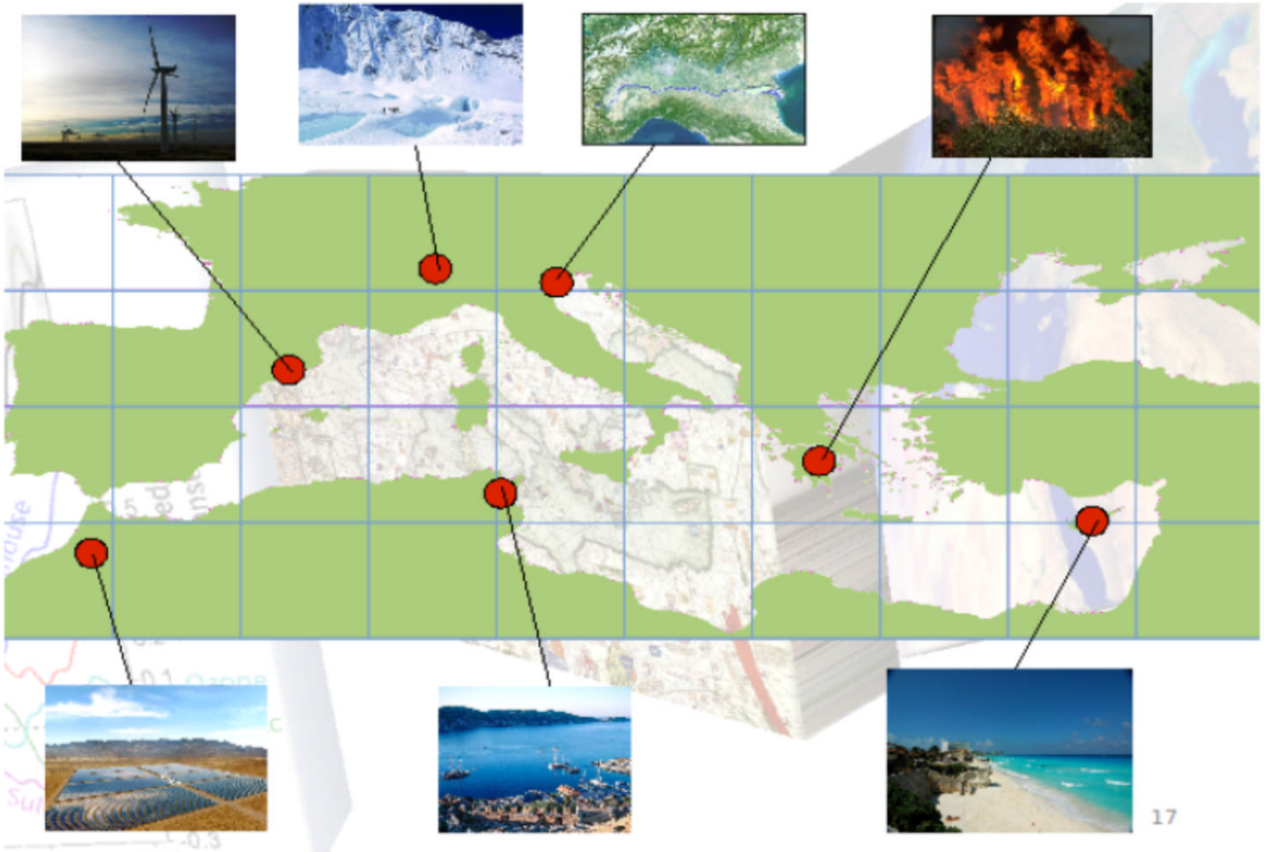

Tourism: Tunisia, France (Savoie), Cyprus, Croatia

Energy: Spain, Morocco, Cyprus, Croatia

Wild Fires: Greece (Spain)

Integrated Case Study: North Adriatic – Veneto/Venice, Croatia

Key CLIM-RUN stages

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- Stage setting (complete)
  - first stakeholder workshops (May-Nov 2011)
- Mapping the issues (complete)
  - perception and data needs questionnaires
- Iterative consultation and collaboration (ongoing)

- Consolidation and collective review/assessment
  - second stakeholder workshops (April/May 2013)
- Going forward: synthesis and recommendations
  - final workshop and end of project (February 2014)

Identifying and selecting stakeholders

e.g., Venice case study used a ranking scheme from social scientists based on:

- importance
- influence
- effects
- relevance
- attitude

Macro

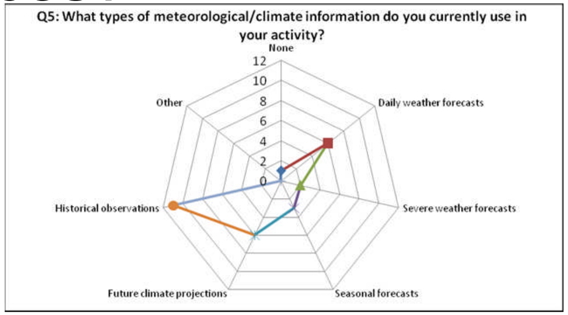
Level	Veneto	Friuli Venezia Giulia
National	▪ Civil Protection, regional office	▪ Civil Protection, regional office
Inter-regional	▪ Autorità di bacino delle Alpi Orientali ▪ Autorità di bacino dell'Alto Adriatico ▪ Autorità di bacino del Po	
Regional	▪ ARPAV ▪ Segreteria regionale per l'ambiente ▪ Segreteria regionale per le infrastrutture e l'urbanistica ▪ Genio Civile (Regione Veneto) ▪ Segreteria regionale per la cultura e turismo ▪ Pesca ed acquacoltura ▪ Servizio idrico integrato: ATO ▪ Industria ▪ Energia	▪ ARPA FVG ▪ Sviluppo sostenibile ▪ Urbanistica e pianificazione territoriale (incluso infrastrutture) ▪ Aree naturali e biodiversità ▪ Ente tutela pesca ▪ Servizio idrico integrato ▪ Industria ▪ Energia ▪ Turismo
Independent Authorities	▪ Port Authoritiy of Venice ▪ ASPO Chioggia ▪ Magistrato delle acque di Venezia ▪ Consorzio di Bonifica Adige Po ▪ Consorzio di Bonifica Delta Po Adige ▪ Consorzio di Bonifica Adige Euganeo ▪ Consorzio di Bonifica Bacchiglione ▪ Consorzio di Bonifica Acque Risorgive ▪ Consorzio di bonifica Piave ▪ Consorzio di Bonifica Veneto Orientale	▪ Port Authoritiy of Trieste ▪ ASPO Monfalcone ▪ Consorzio di Bonifica Bassa Friulana ▪ Consorzio di Bonifica Cellina Meduna ▪ Consorzio di Bonifica Ledra Tagliamento ▪ Consorzio di Bonifica Pianura Isontina
Parks and reserves	▪ Parco Regionale Veneto del Delta del Po ▪ Riserva Naturale Bocche di Po ▪ Riserva Naturale Integrale Bosco Nordio	▪ Area Marina Protetta di Miramare ▪ Riserva Naturale della Foce dell'Isonzo ▪ Riserva Naturale Foci dello Stella ▪ Riserva Naturale della Valle Canal Novo ▪ Riserva Naturale della Valle Cavanata ▪ Riserva Naturale delle Falesie di Duino ▪ Riserva Naturale regionale laghi di Doberdò e Pietrarossa ▪ Riserva Naturale della Val Rosandra ▪ Biotopo Magredi di San Canciano
Provinces	▪ Venezia ▪ Rovigo	▪ Trieste ▪ Gorizia ▪ Udine
Municipalities	▪ San Michele al Tagliamento ▪ Caorle, Eraclea ▪ Jesolo ▪ Cavallino-Treporti ▪ Venezia ▪ Chioggia ▪ Rosolina ▪ Porto Viro ▪ Porto Tolle	▪ Muggia ▪ Trieste ▪ Duino Aurisina ▪ Monfalcone ▪ Staranzano ▪ Grado ▪ Marano Lagunare ▪ Lignano Sabbiadoro

Micro

Collaborating
with
stakeholders

The ‘who’ and the ‘what’

- Who are the climate services stakeholders?
  - – Why is climate variability and change relevant to them?
  - – How do climate issues fit within their decision making mechanisms and their perception of risk?
- What do they need/want from climate services?
  - – Specific data
  - – Analysis tools
  - – Guidance and training
  - – Other things…..



Information has come from:

- **Perception & data needs questionnaire**
- **Stakeholder interviews**
- **Local workshops (15 events)**

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Distinguishing timeframes

- Do you want seasonal forecasts (i.e., for next few months)?
- Do you want decadal predictions? If yes: for next 10/20/30 years – please specify
- Do you want climate change projections? If yes: for next 10/20/30/40/50/100 years – please specify

Glossary definitions:

Climate projection; Decadal prediction; Seasonal forecast; Climate; Climate variability; Weather

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So ‘what’ do stakeholders need?

In addition to temp/prec and derived indices/extremes:

- Wind (speed, dir., ‘consistency’) snow, humidity, cloud
- Radiation (esp. DNI for solar energy)
- Sea bathing water T, SLR, storm surge, wave height
- Local winds (Bora, Scirocco) and dust storms
- Tourism comfort indices & Fire Weather Index

More interest in next 20-30 years (50 years at most)

i.e., seasonal/decadal rather than ‘climate’ timescales *(though little current use)*

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How to meet stakeholder needs?

- ‘Translation’ process – Climate Expert Team (CET)
- Categorising needs (observations/simulations):

  0 not possible to provide; 1 already available;

  2 easy to provide; 3 able to provide, but with a lot of work

- Production of first examples of products and outputs
- Definition of new modelling tools required

- Iterative discussion with stakeholders (through SET)

Draft!

CLIM-RUN Product Information Sheet: January 2013

ADVANCED WIND RESOURCE RISK MANAGEMENT: Wind Speed Forecasting over Seasonal Time Scales

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Keywords: wind resource assessment, seasonal forecast, wind energy

Target Groups

- **Wind energy institutions** (EWEA, GWEC)
- **Wind energy stakeholders** (Project investors, insurance companies, project developers/ managers, grid operators/planners, wind resource assessment service providers)

Relevance to the Case-Study Requirements

The variability of wind resources is directly linked to the energy yield of a wind farm. Throughout a wind energy project's life, it is currently unknown how much the wind resources could vary from one season to the next. The assumption is therefore made that long-term wind resource availability is constant; that future wind resource will reflect the past and its variability is consistent across all timescales. The potential risk that future wind resources could be significantly different over space and time is currently not assessed, nor have tools been made available to deal with this risk. This creates an uncertainty that affects investment and operations for wind projects and the grid network.

The Approach

Long-term wind energy resource estimates are currently inferred from archives of global weather forecasts and in-situ observations of, e.g., the past 10 years, and reanalysis data of e.g. the past 30 years, when no direct observations are available. The statistical components (moving means etc.) of this data enables wind speeds to be forecast for weeks or months ahead, although with inherently large uncertainty. Seasonal climate forecasts can help to reduce this uncertainty i.e. to improve a longer-term forecast above the current observational estimate used. It achieves this by looking beyond the trend of the statistical components and assessing the variability of the climate means over past timescales.

Seasonal wind forecasts are divided into two stages: first, a climate forecast system produces seasonal wind predictions (3 months for each season) for as many cases in the past as possible (typically using a baseline period of 1981-2012). These predictions are based on the monthly means and include an estimate of their uncertainty, depending upon the spread of the forecast ensemble members and their ability to reproduce the observations. This measure of uncertainty is used to assess the forecast quality of the system (i.e. the skill). Second, probabilistic future wind information is produced as an operational tool that shows the distribution of the forecast ensemble members over three categories: above normal, below normal and normal wind speeds, and the probability of the event to happen, based upon the number of forecast members within each of the categories.

CLIM-RUN Product Information Sheet: January 2013

ADVANCED WIND RESOURCE RISK MANAGEMENT: Wind Speed Forecasting over Seasonal Time Scales

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Product Example

Seasonal wind forecasts for Spring (March, April, May)

STAGE 1: An estimate of the climate forecast system quality is made, by producing wind predictions for as many cases in the past as possible.

Figure 1a. ECMWF S4 ensemble mean 10m wind speed (m/s) anomaly forecast

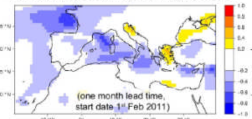


Figure 1b. ERA-Interim 10m wind speed (m/s) reanalyses "observations"

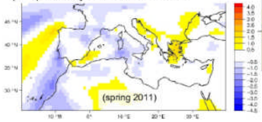
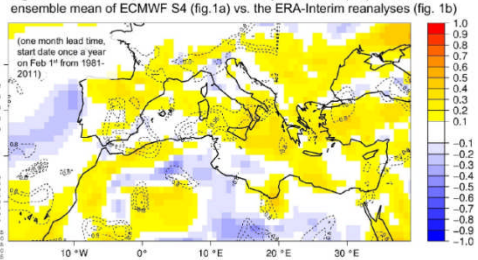


Figure 2. 10m Wind speed re-forecast anomaly correlation (AC) skill of the ensemble mean of ECMWF S4 (fig.1a) vs. the ERA-Interim reanalyses (fig. 1b)



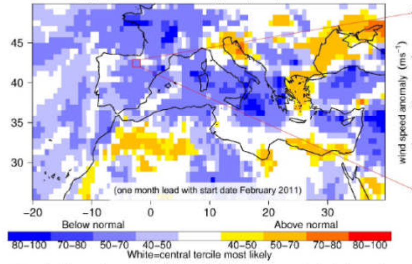
Result: Low, but predominantly positive skill is observed across the Mediterranean where the direct model output reaches approximately AC 0.3.

A low climate forecast quality skill (figure 2) does not mean that there is no useful wind information in the forecast. The best way to extract this information is using probabilistic forecasts (figures 3,4)

STAGE 2: Operational predictions are issued that enables probabilistic future wind information.

- Regional -

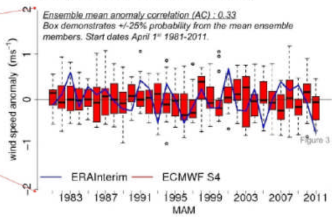
Figure 3. Probabilistic three category, spring 2011 forecast for 10m wind speed from ECMWF S4. The colour shows the tercile that contains more forecast members than any of the other two and the probability (%) of the event to happen (except for near normal).



Result: The system generally predicts below normal winds in western Europe in spring 2011, with a probability of 70% and higher.

- Site Specific -

Figure 4. The distribution of the 15 ECMWF S4 forecast members during spring vs. ERA-Interim at a grid point in Pamplona, Spain (a region with operational wind farms).



Result: Some skill (AC) is seen, when predicting the wind variations for the spring months each year, of 0.33 (where 1 corresponds to a perfect forecast and 0 to a no informative system), although this fit varies from year to year.

The credibility of these operational predictions is partially based upon the system forecast quality (stage 1), but a detailed analysis of the ability of the forecast system to reproduce the resource availability is needed for a full assessment of its value.

Making the Product Usable

The correspondence that is seen between forecasts (figure 1a) and observational estimates (figure 1b) suggests that an operational, probabilistic seasonal forecast (figure 3) contains some useful information for risk management when planning and operating wind energy projects over certain geographical regions. The probabilistic forecast for Pamplona, Spain (figure 4) shows certain years that demonstrate a reasonable forecast (e.g. 1997, 2000), although other years show little or no correspondence. The skill of 0.33 for a spring forecast over all years (1981-2011) highlights the potential for using seasonal wind forecast information in wind energy operational risk management for a given project site.

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Some issues and questions

- Use of the perception questionnaire
  - Flexibility vs consistency (different versions)
  - Too technical/difficult to complete for some stakeholders
  - Did not provide all details CET would have liked

- Balance between ‘showing examples’ and ‘constraining the agenda’

- To what extent do needs depend on the timeframe of interest?
  - Different variables/resolutions for S2D and climate change??
  - Don’t forget observations (current/recent past)!

- Reliability of forecasts/predictions
  - Explaining the differences between forecasts/predictions/projections

The CET and SET: Aris Bonanos, Philip Bourdeau, Čedo Branković, Adriana Bruggeman, Sandro Calmanti, Adeline Cauchy, Jean Chapoutot, Katarina Charalambous, Melanie Davis, Paco Doblas-Reyes, Clotilde Dubois, Christos Giannakopoulos, Valentina Giannini, Filippo Giorgi, Clare Goodess, Silvio Gualdi, Panos Hadjinicolaou, Maria Hatzaki, Latifa Henia, Manfred Lange, Robert Pasicko, Anagyrous Roussos, Paolo Ruti, Peter Schmidt, Samuel Somot

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