ECMWF Web re-engineering project

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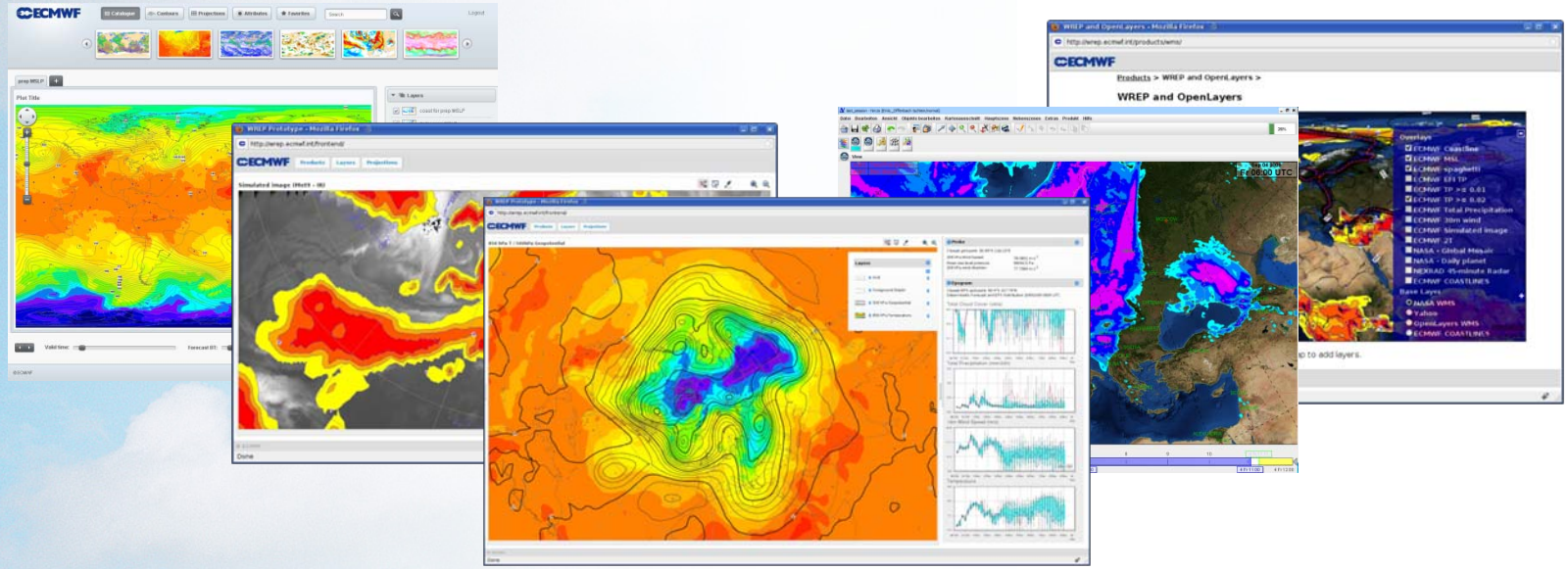
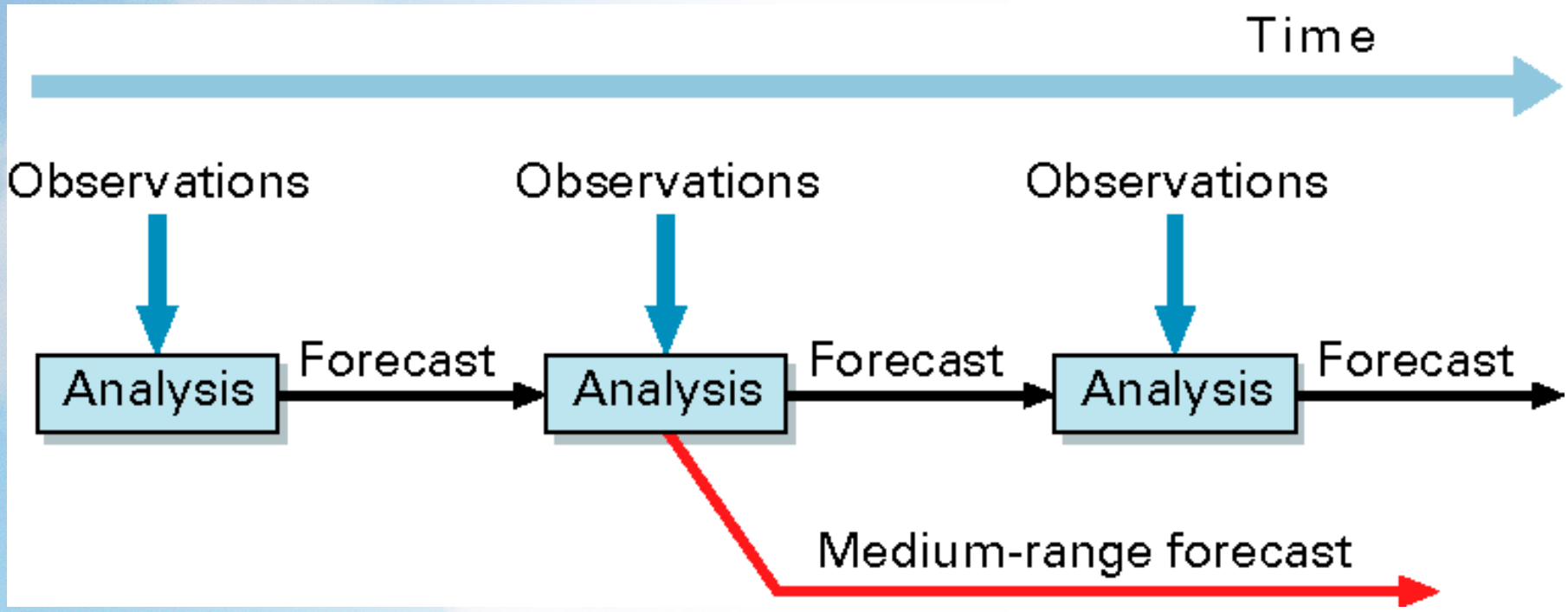


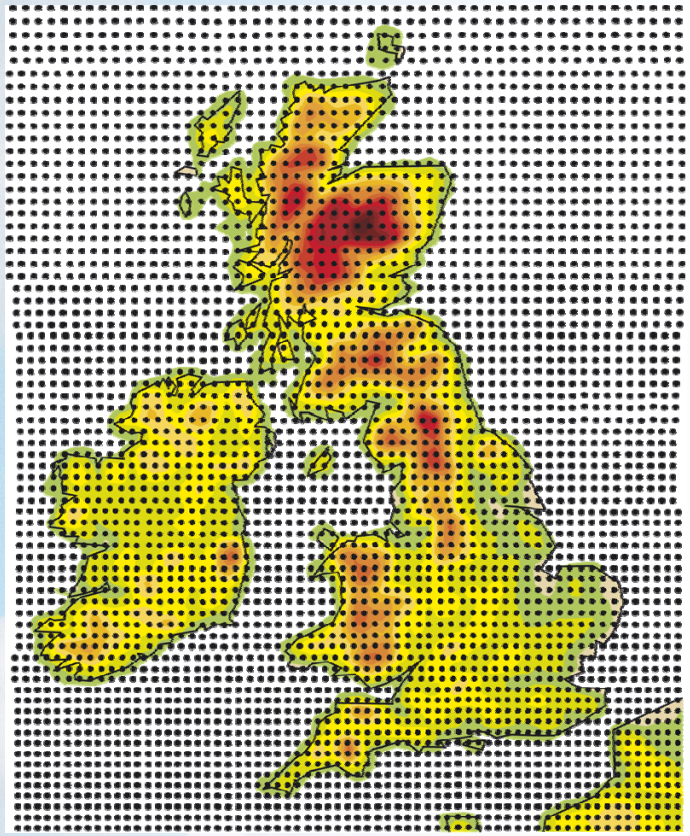
Dealing with large amount of multi-dimensional data

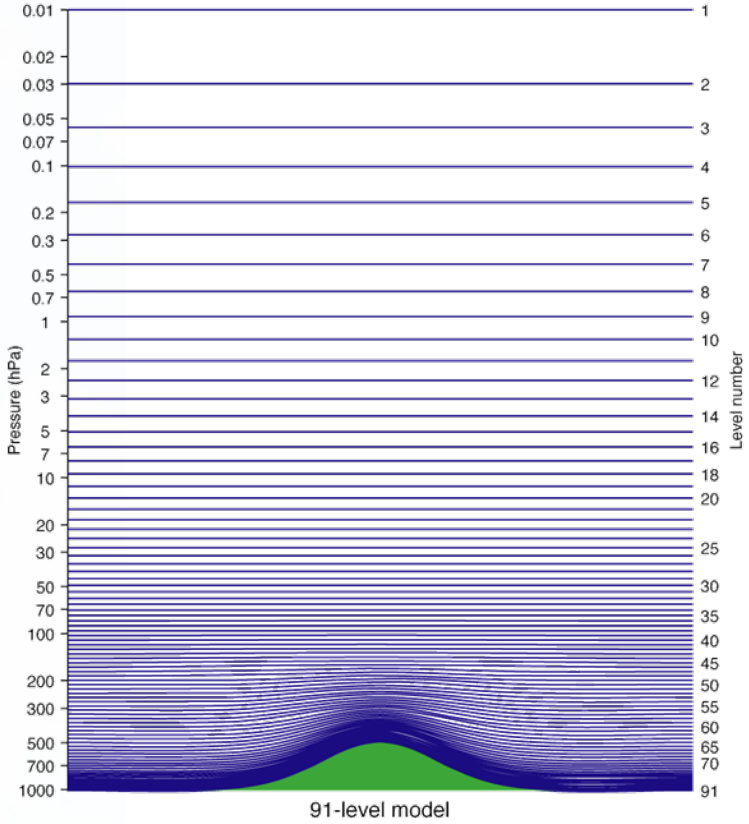
- Forecasts run several time a day, providing regular update of the possible future



Dealing with large amount of multi-dimensional data (cont.)

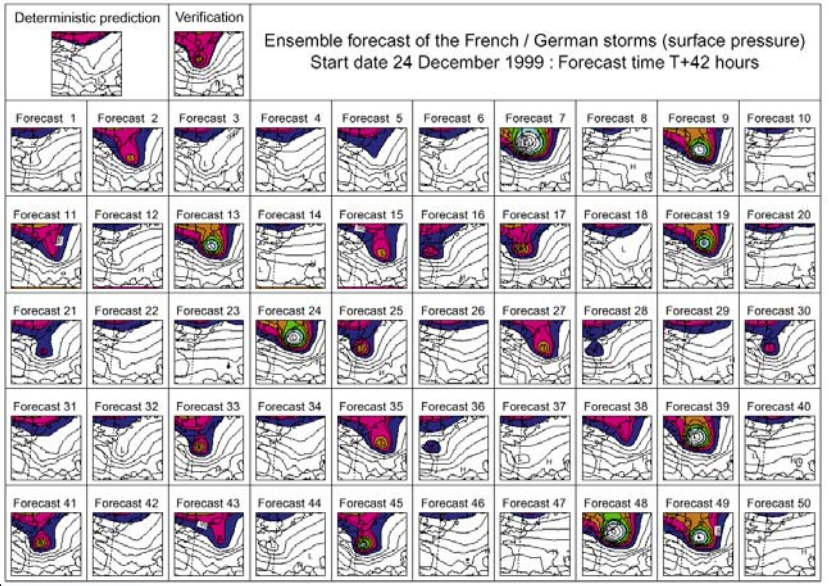
- Each model grid point represent hundreds of meteorological variables: temperature, pressure, precipitations, …
- The atmosphere is split vertically into many levels

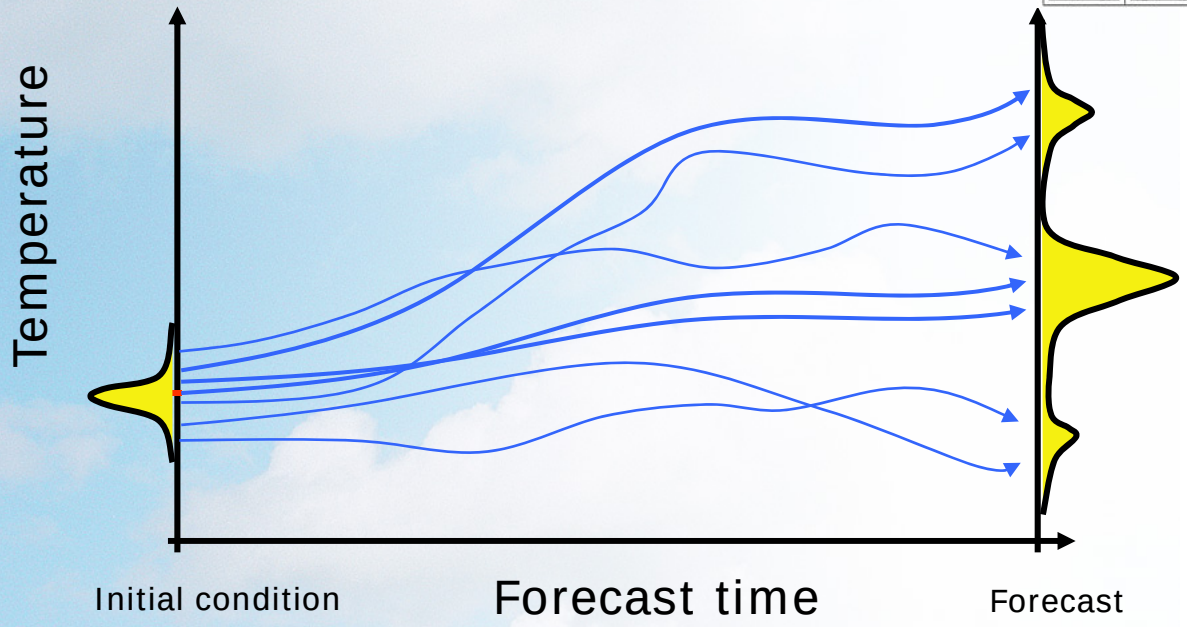




Dealing with large amount of multi-dimensional data (cont.)

- Ensemble Forecasts: capturing the chaotic nature of the atmosphere
- Forecast many equally possible futures





Dealing with large amount of multi-dimensional data (cont.)

- Meteorological data is multi-dimensional
  - 3 dimensions of space
  - 2 dimensions of time (analysis time, forecast time)
    - … and many more for ensemble prediction systems (many possible futures)
  - 100s of variables (Temperature, Wind, Clouds, Humidity,…)
  - many different models
    - Short range, Medium range, Monthly, Seasonal, …
    - Global, Limited area
    - From several NWP centres around the world
- Current web interfaces are limited to:
  - 2 space dimensions (screen)
  - 1 time dimension (animation)
  - 4 colour dimensions (red, green, blue and transparency)

Dealing with large amount of multi-dimensional data (cont.)

- Make full use of available graphical tools
  - Layering
  - Colour, transparency, symbols
  - Animations
  - Re-projections
- Provide statistical analysis tools
  - Means, probabilities, clustering, …
  - Time series, cross-sections, …

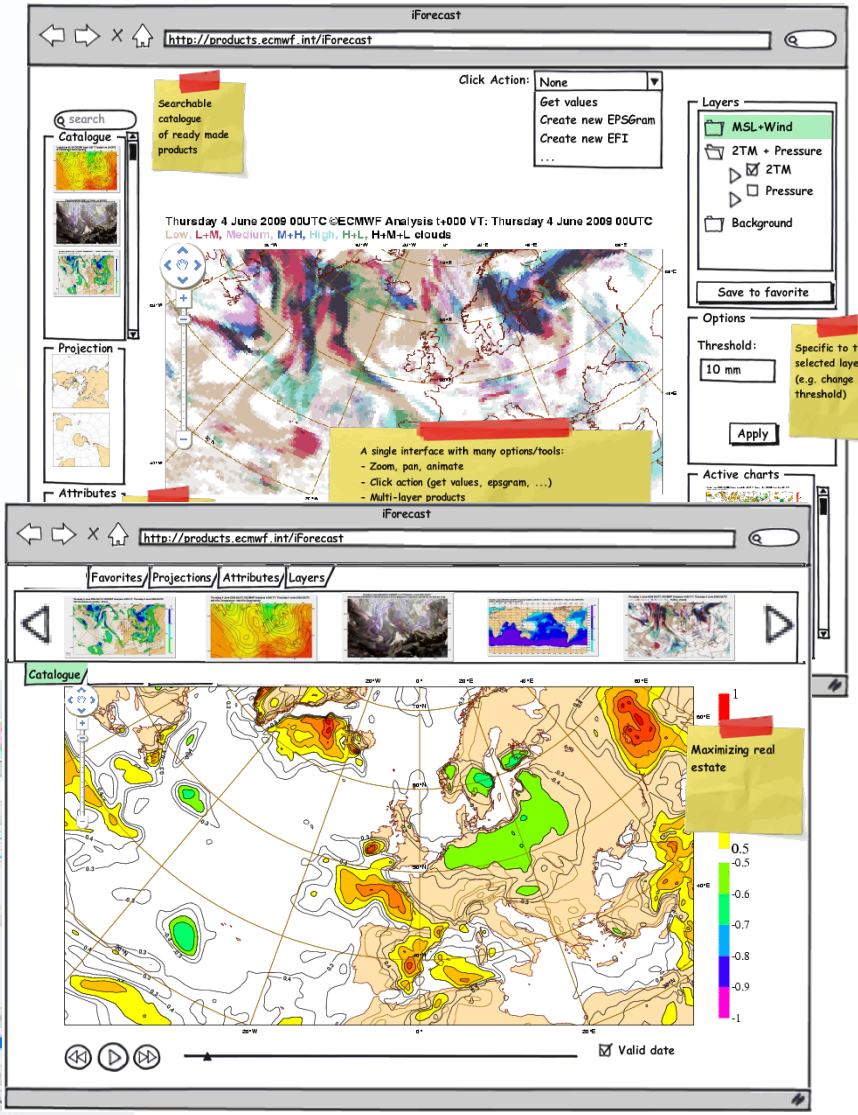
- Give the user full control over these tools
  - … so they can choose what suit their current workflow
  - Requires the ability to run these tools “on-demand”, based on user input, in a reasonable time (e.g. <10s)

ECMWF Web re-engineering project:

- Motivations
  - Increasing use by our supporting states and many commercial customers of our web products
    - Demand for a high availability service
  - Users request more tailored products
    - Requires on-demand plot production
- Goals
  - Redesign the web infrastructure so that the web service is highly available
  - Provide more interactivity (e.g. zoom, pan, overlay parameters)
  - Allow product customisation (e.g. control the event threshold on probability maps)
  - Use open (OGC) standards so that ECMWF products can be embedded in users' own software
- Aimed directly at our Member States forecasters and commercial customers

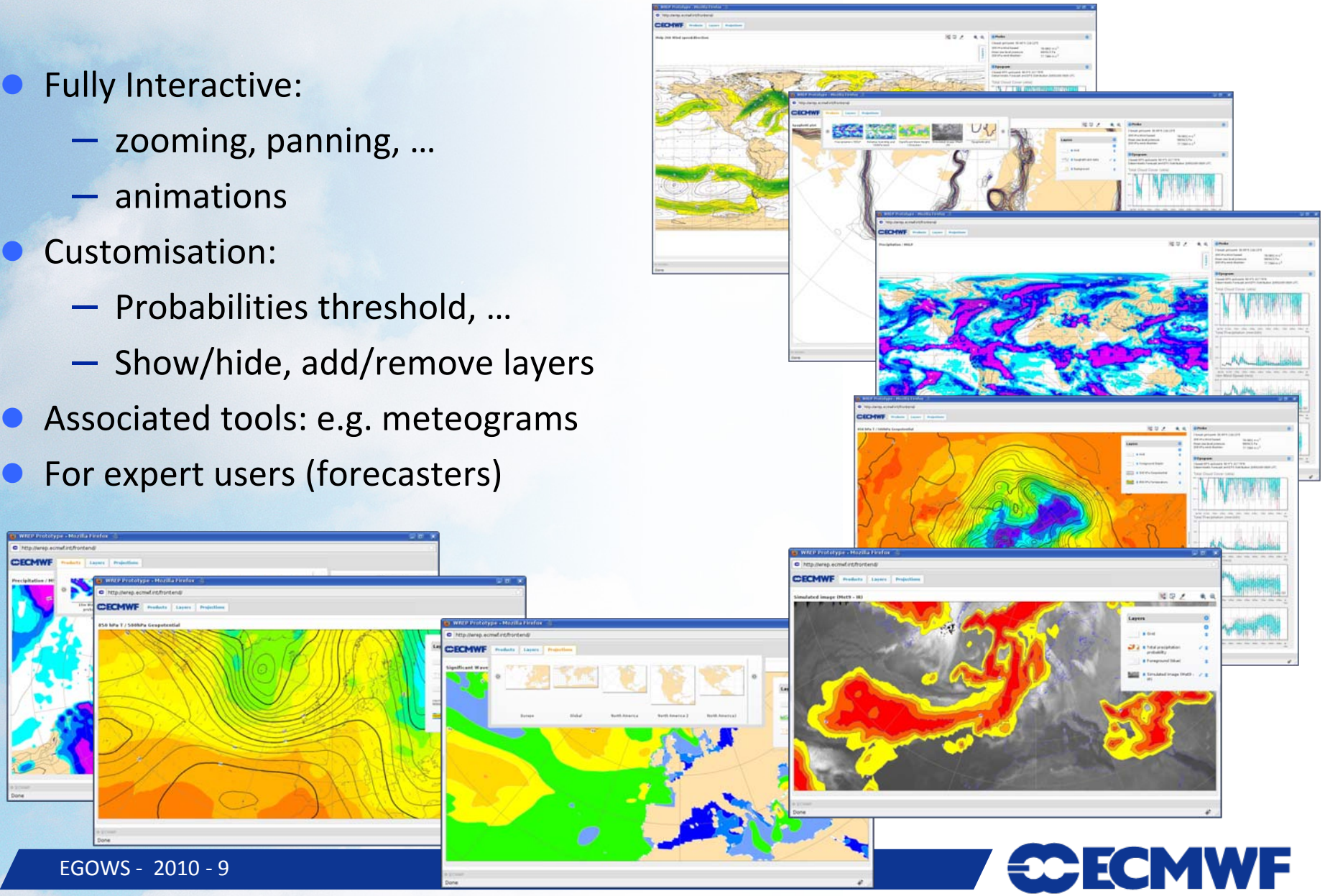
Gathering of user requirements

- The project has been presented on several occasions
- Consultation process will continue throughout the project
- Focus on usability



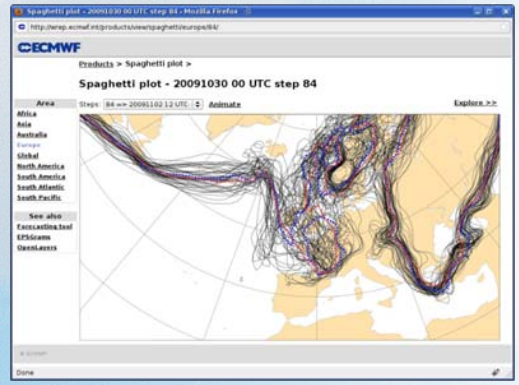
Application 1: Web based forecasting tool

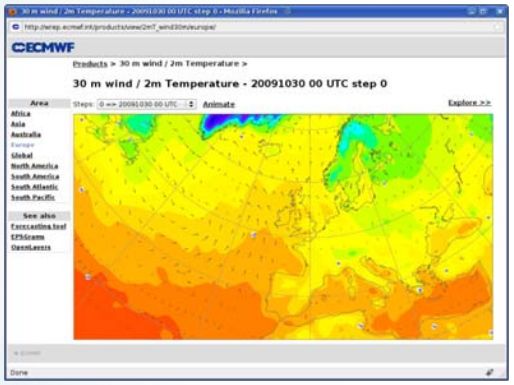
- Fully Interactive:
  - zooming, panning, …
  - animations
- Customisation:
  - Probabilities threshold, …
  - Show/hide, add/remove layers
- Associated tools: e.g. meteograms
- For expert users (forecasters)

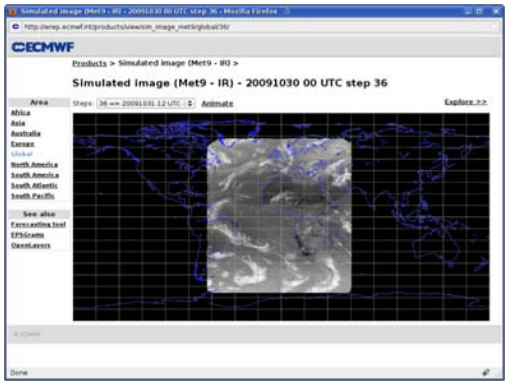


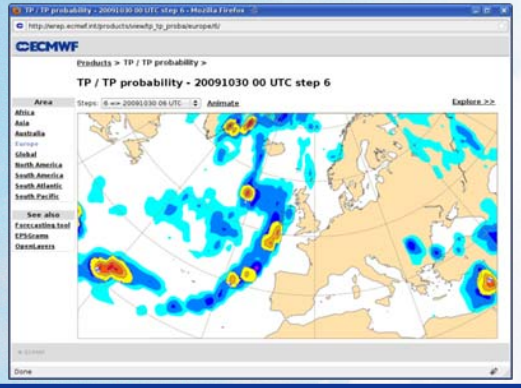
Application 2: Product catalogue

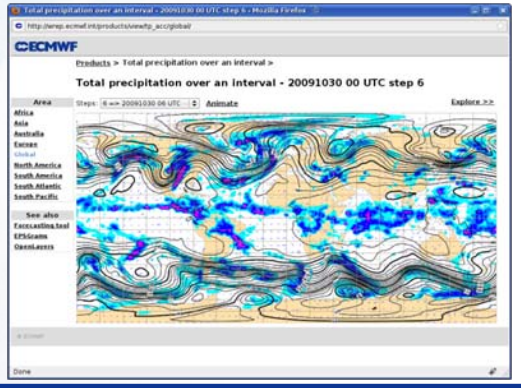
- Browsable and searchable graphical product catalogue
- Limited interactivity – Preset number of projections, animation
- Intended to be used by a wider audience

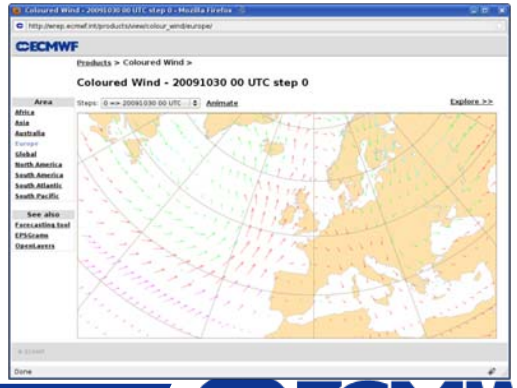






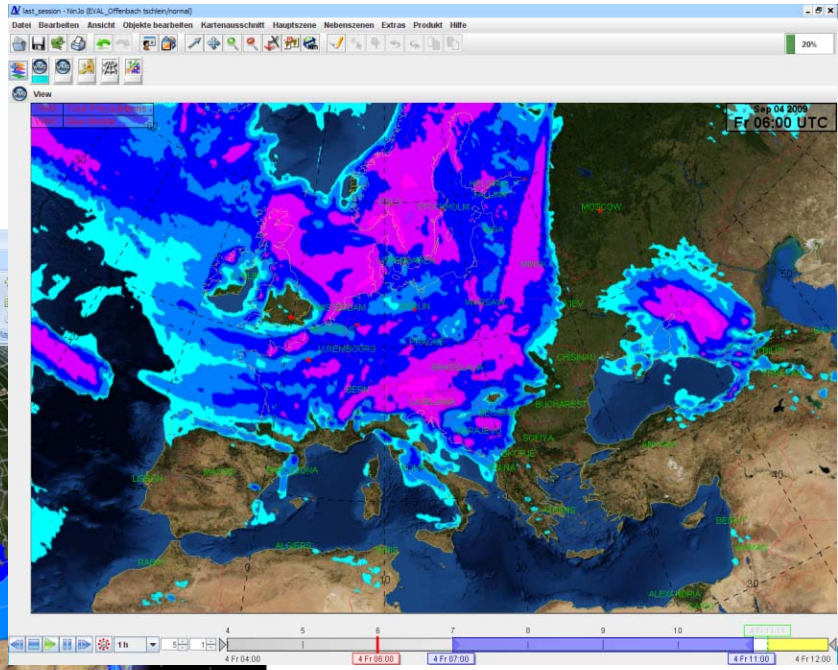


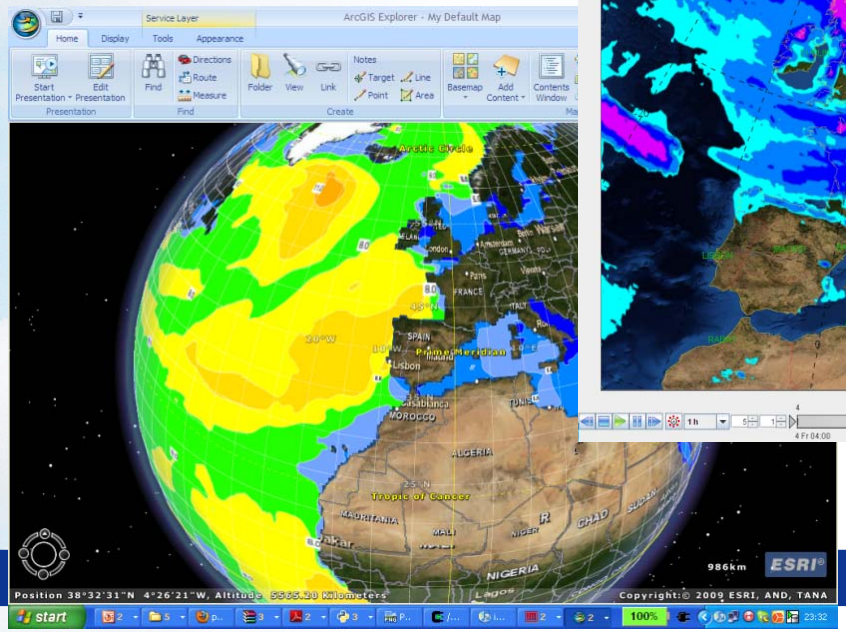




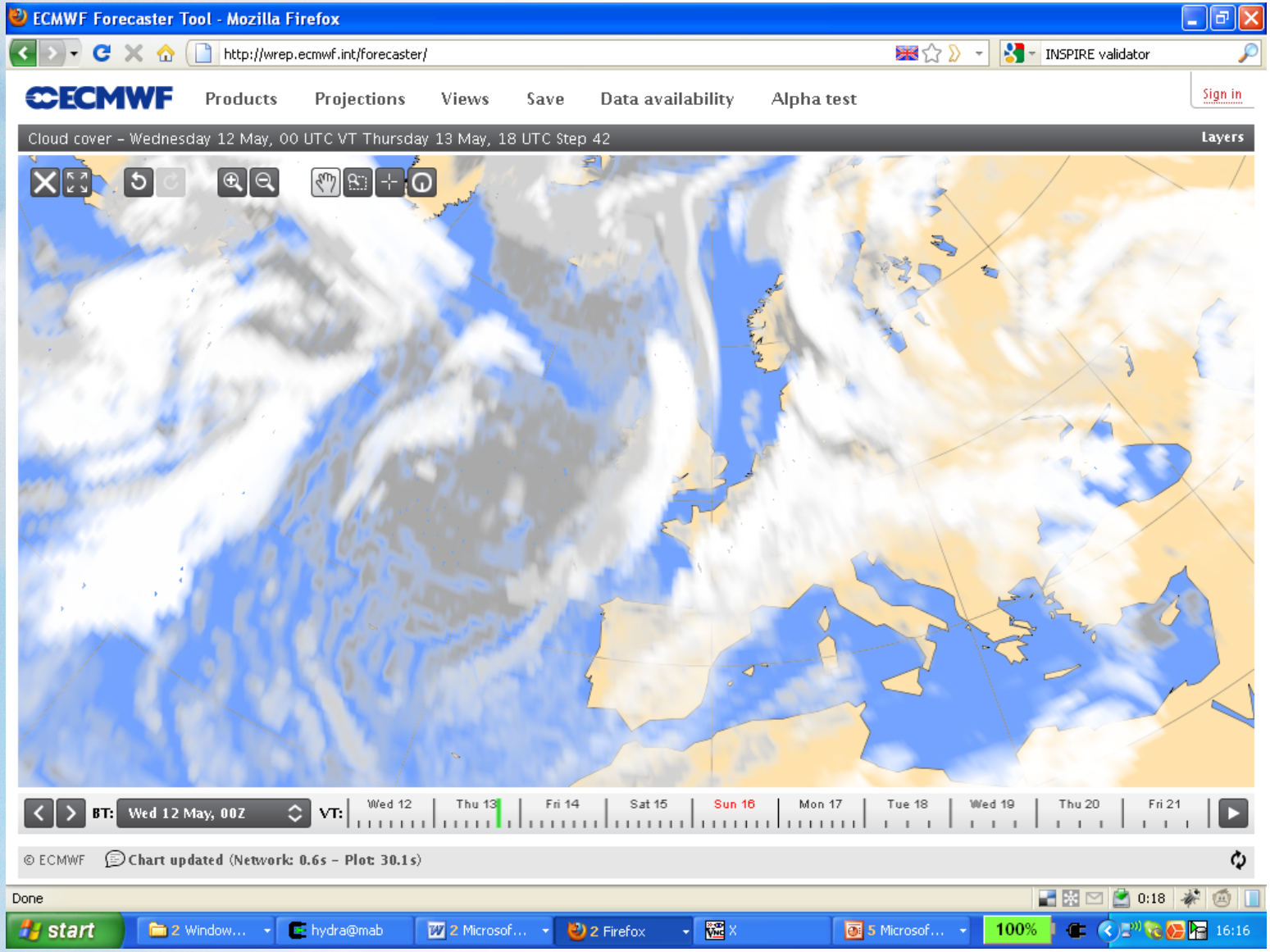
Application 3: OGC Web Map Services

- So that ECMWF products can be directly embedded in the forecasters' workstations application
- All products accessible via WMS protocol:
  - "GetCapabilities" document build dynamically from product catalogue content
  - Layers are created on-demand
- Challenges:
  - access control
  - time dimension
  - customisation

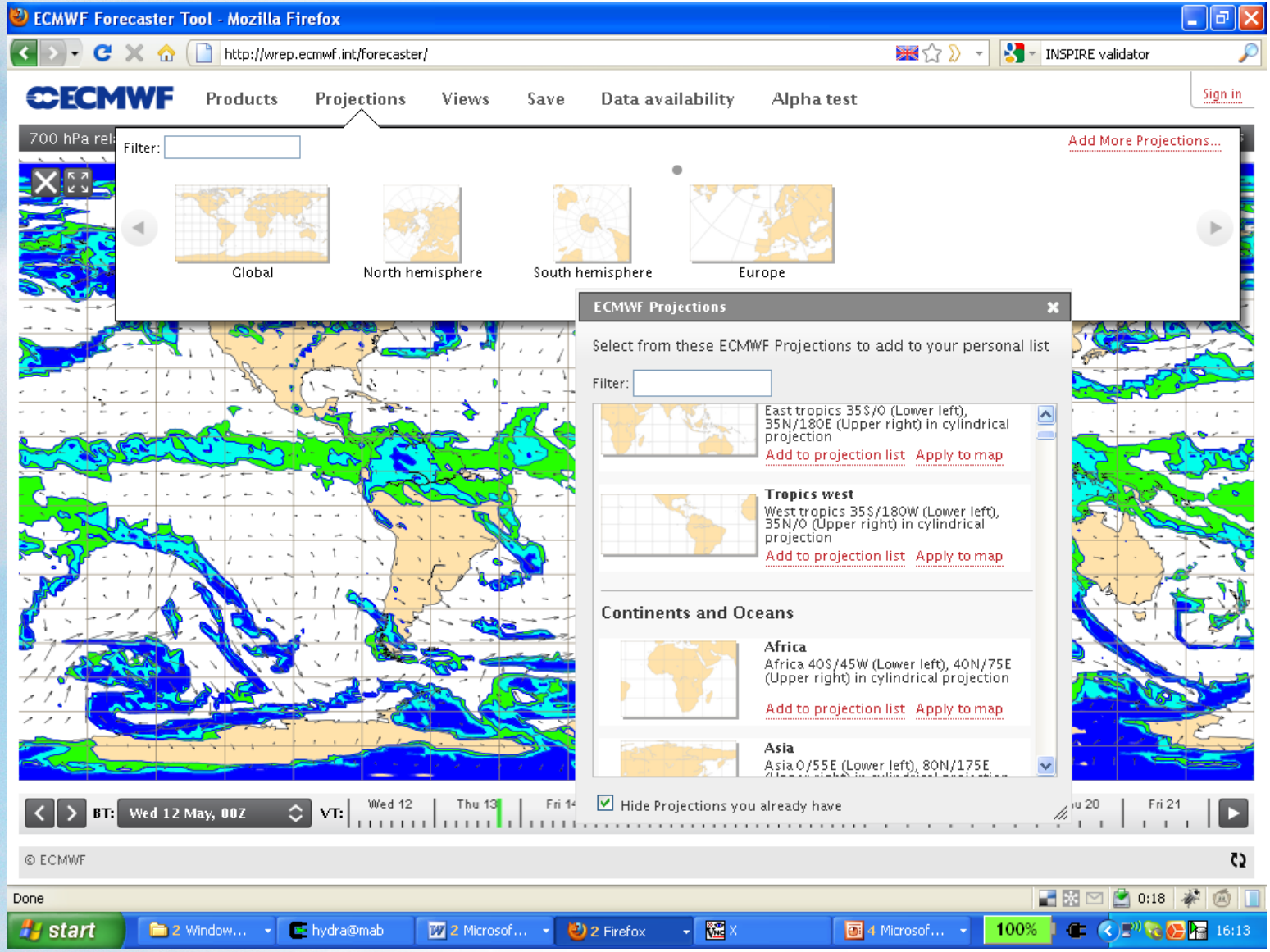




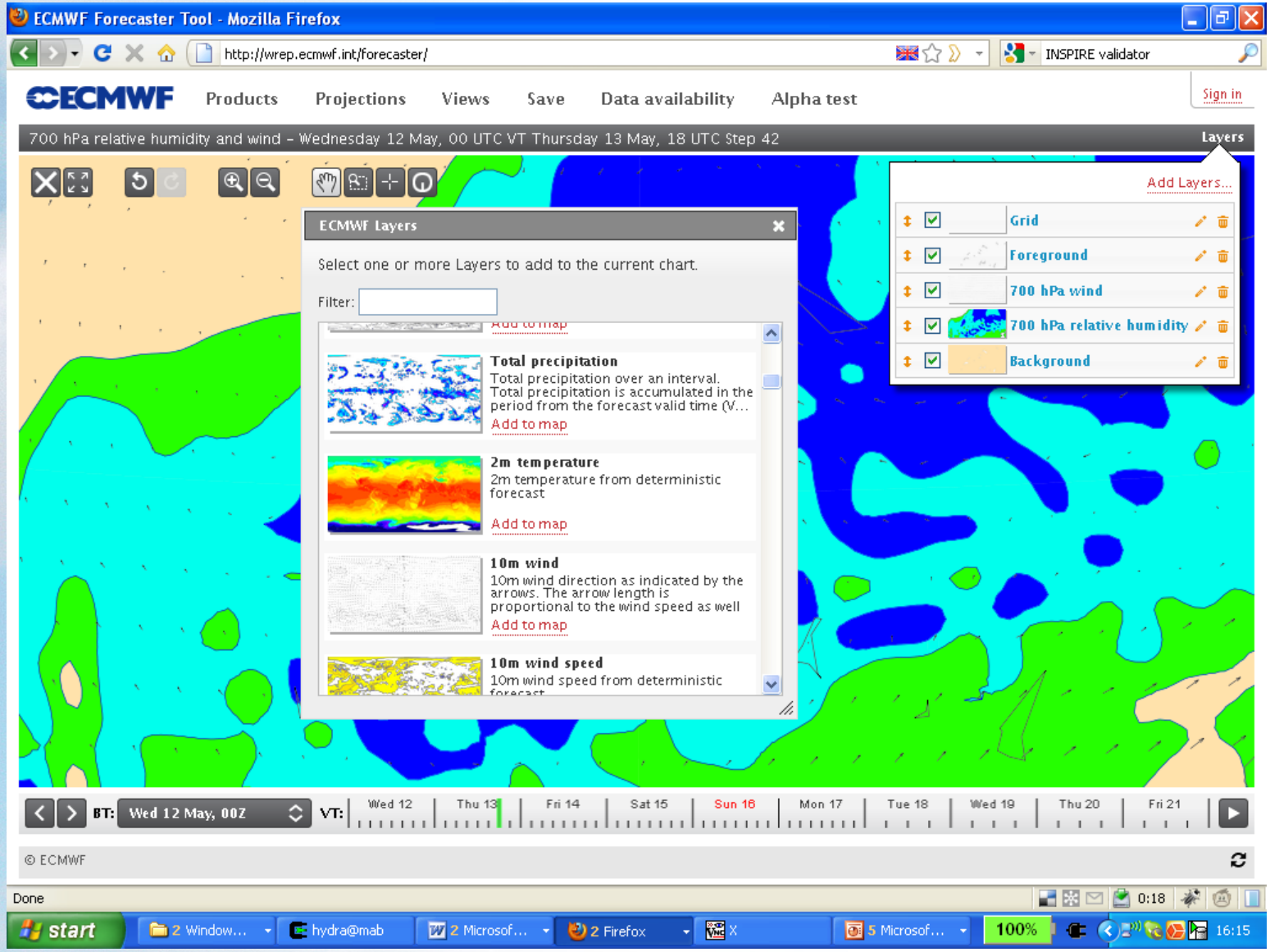
Forecasting tool main user interface



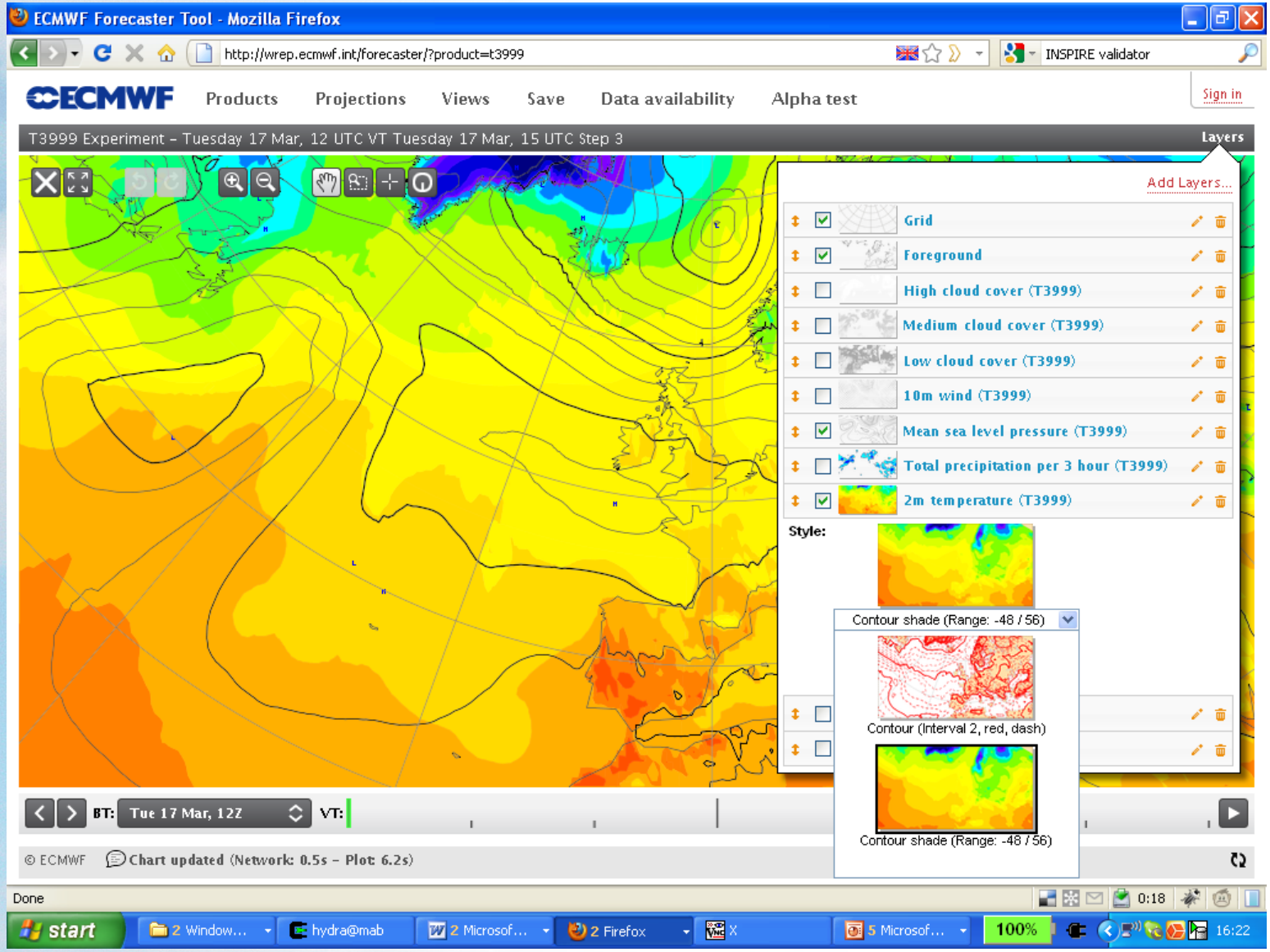
Predefined projections



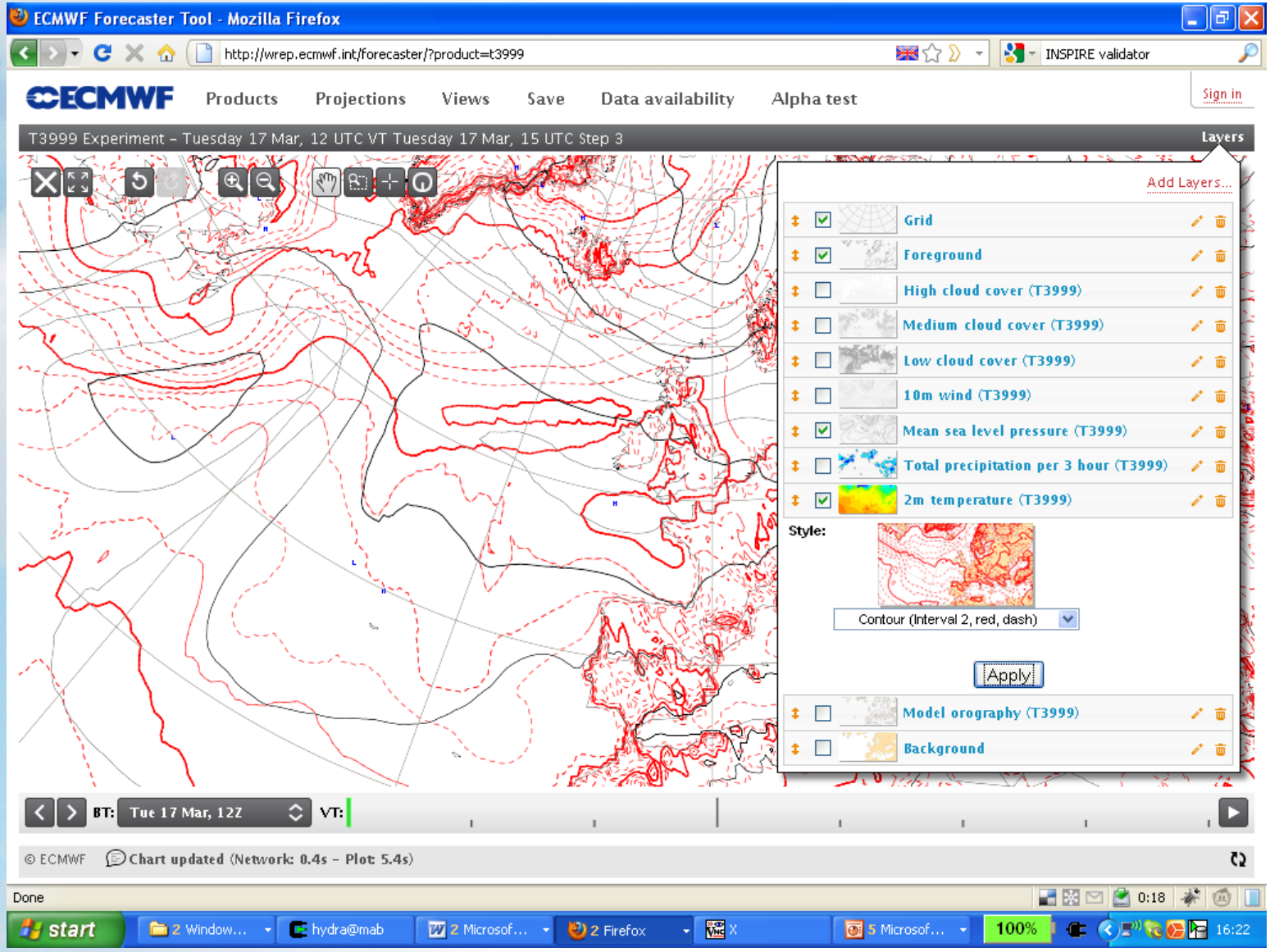
Multi-layer maps



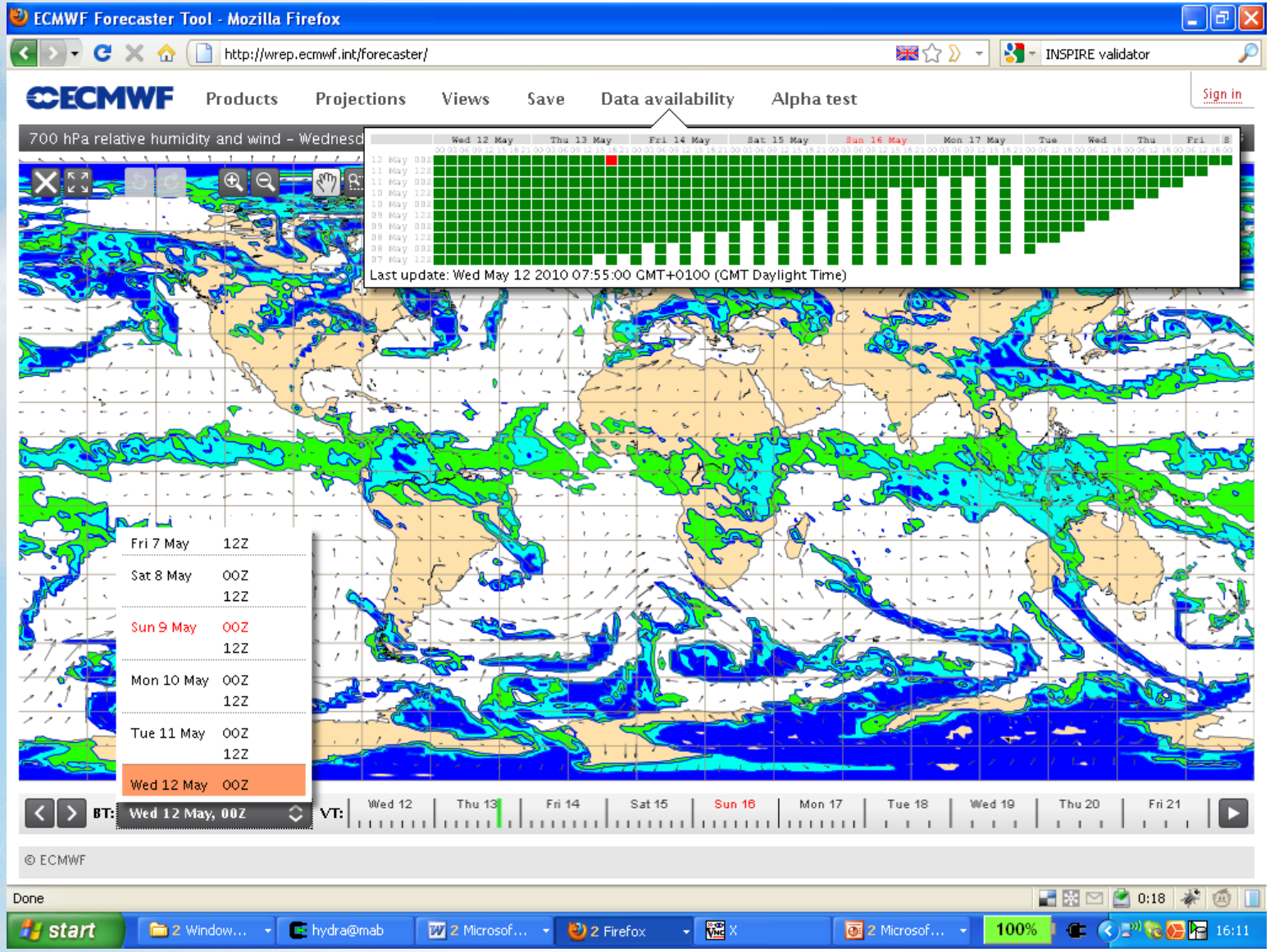
Controlling style



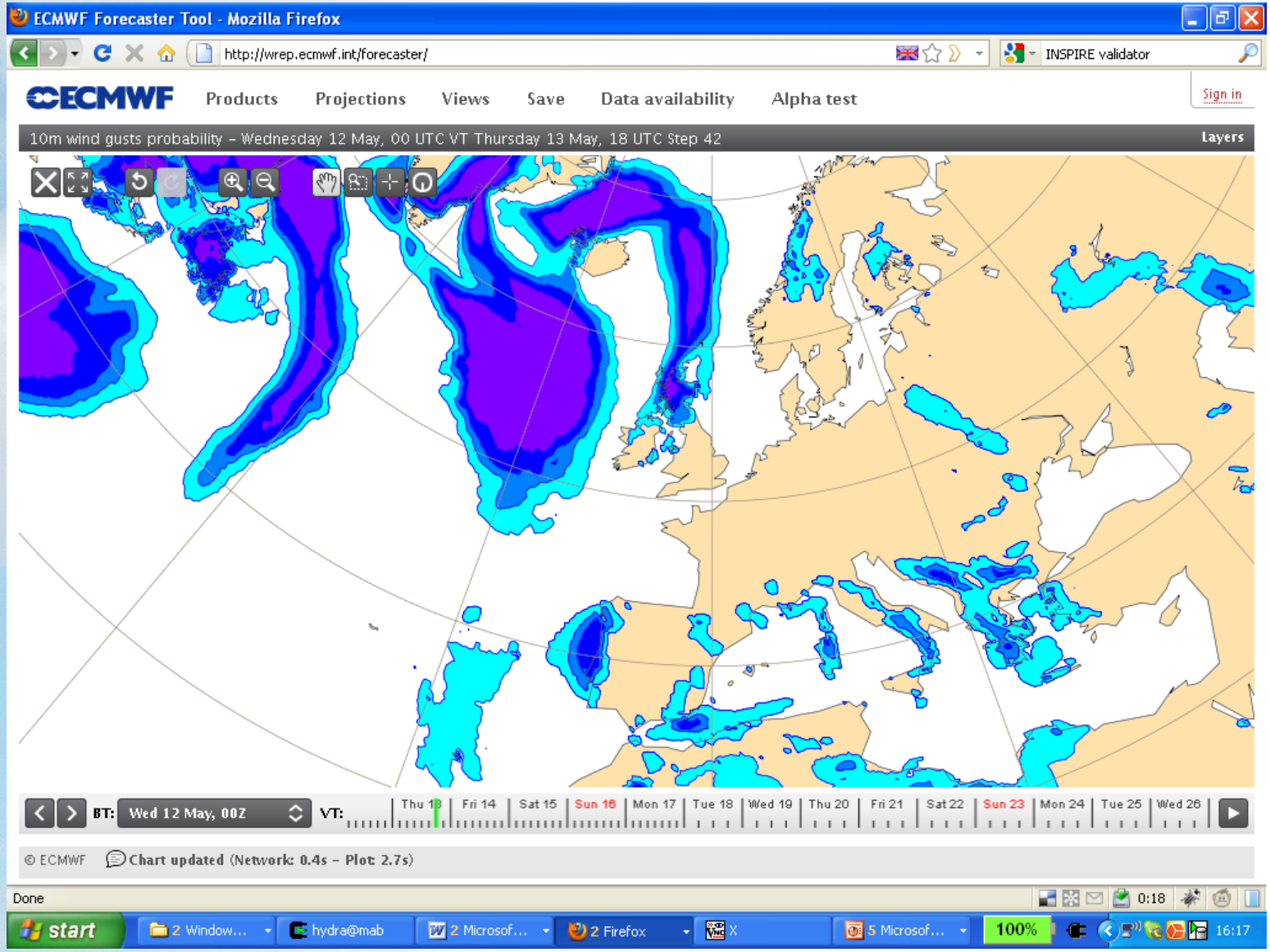
Controlling style (cont.)



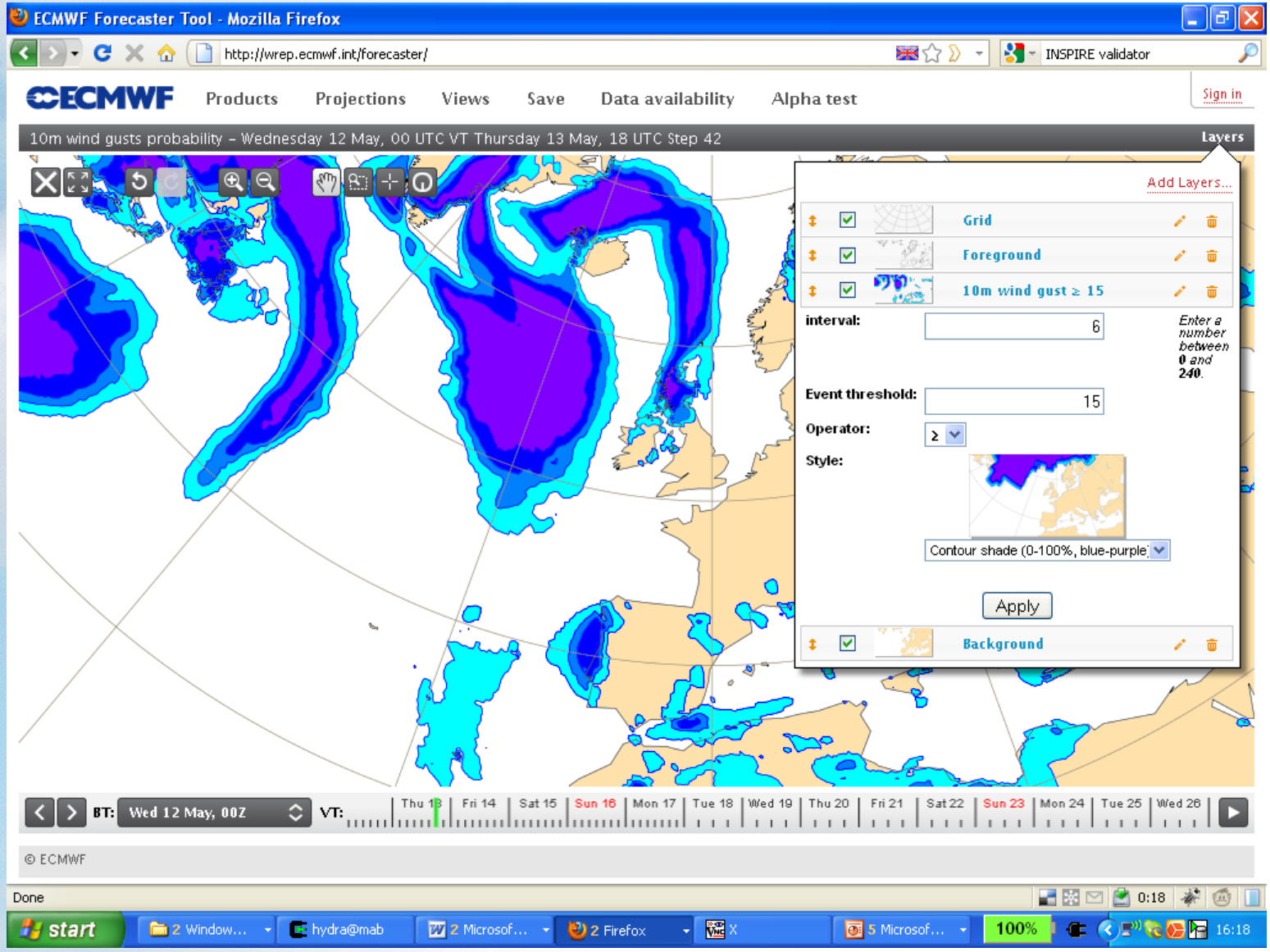
Handling time dimensions



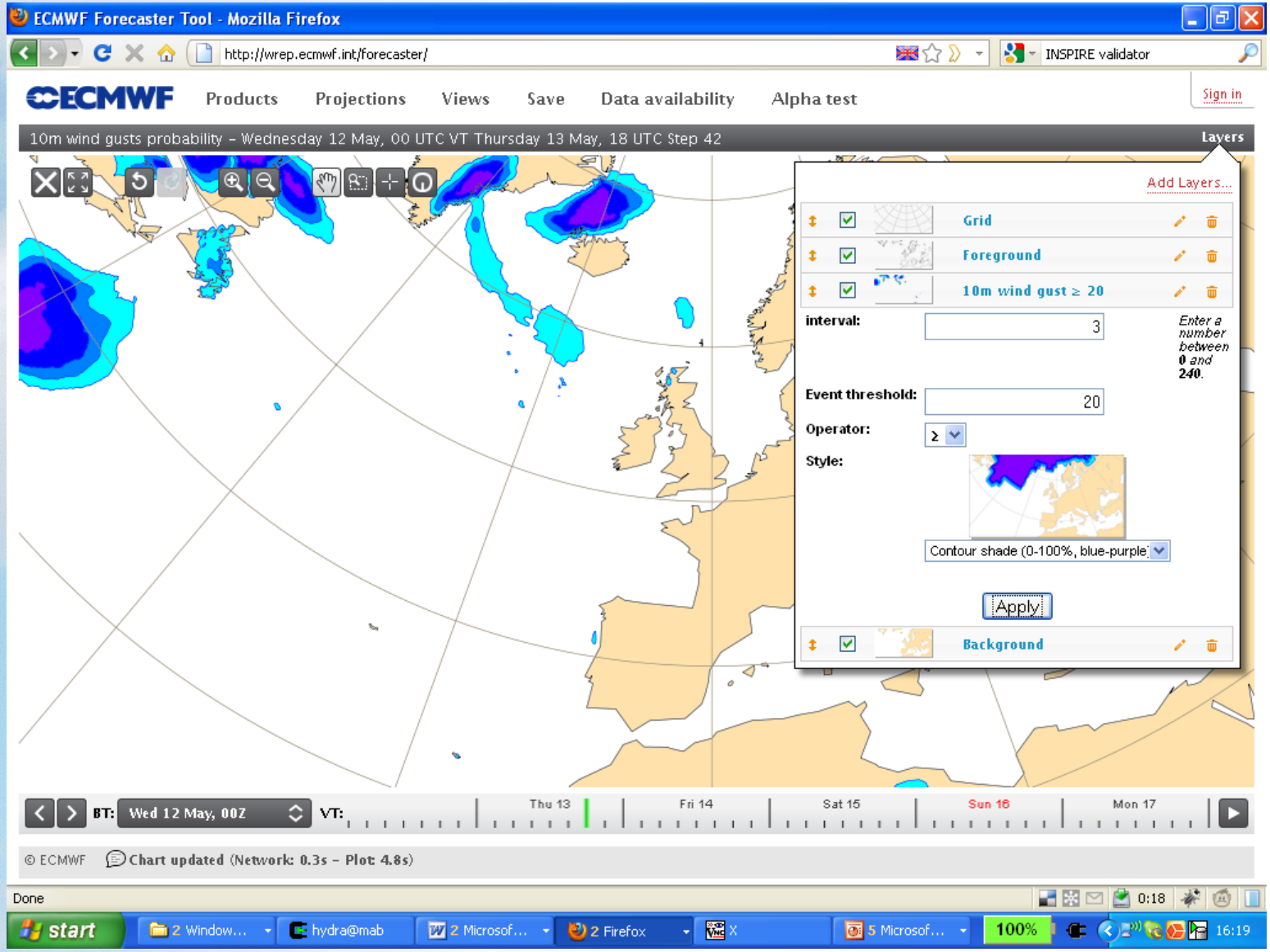
EPS data: probability maps



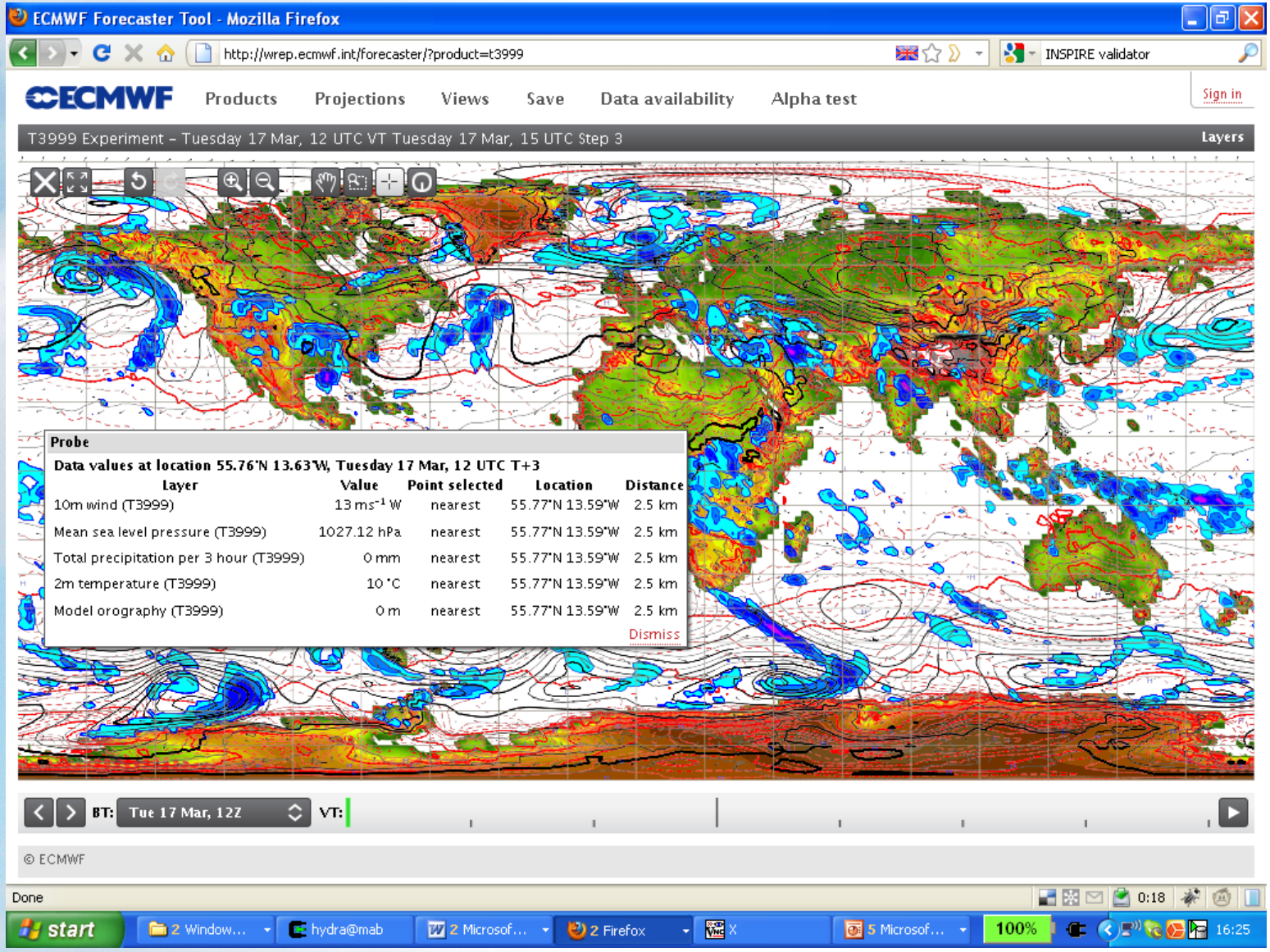
EPS data: probability maps (cont.)



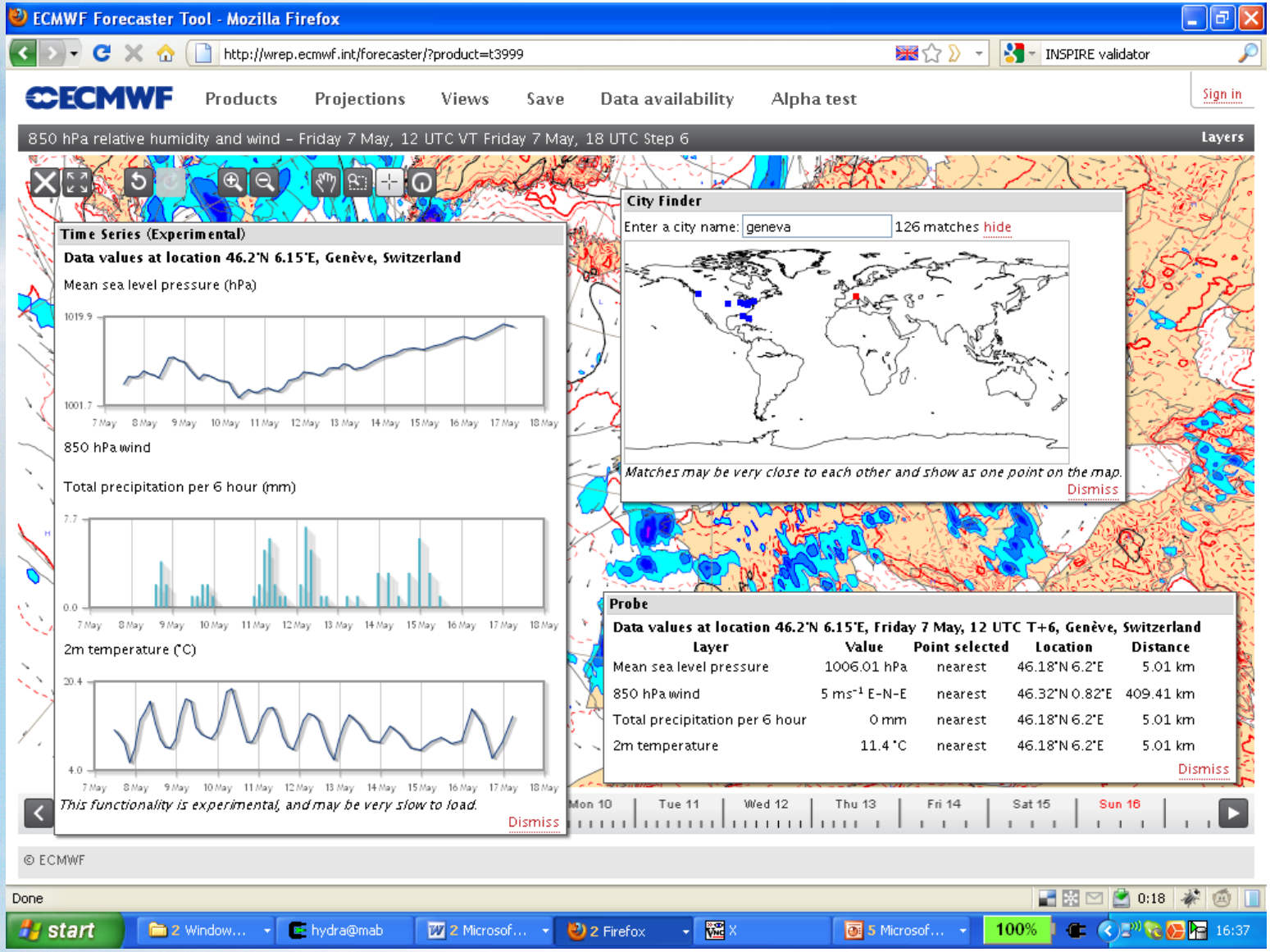
EPS data: probability maps (cont.)



Data exploring tools



Data exploring tools (cont.)



Project Status

- Half way into the project
  - Alpha test with forecasters from our Member States will start soon
- Infrastructure work
  - Security and access control
  - Monitoring, alerts and service statistics
  - Management tools
  - Performance tuning
- Product development
  - Clustering
  - Tropical cyclone tracks
  - Extreme forecast indices
  - Monthly and seasonal products
  - Quality and performance scores
  - …

Thank you