Q1: What forecasting aspects are of particular concern to you and your organisation that relate to ECMWF output?

➤ Very wide ranging activities. Particular interest in all sorts of **hazards**, including aviation-related (not so well served).

➤ Extra-tropics and Tropics.

➤ Direct (eg rainfall) and indirect (eg fires)

➤ **Convective hazards** very widely mentioned. Expectations/hopes high, but not always matched!

➤ Seasonal also widely referenced. Expectations/hopes mostly not met.

➤ Some evidence of a shift towards needing quantitative forecasts for downstream applications – eg hydrology - not just EFI-style guidance

➤ Big uptake of **reanalyses/re-forecasts/**e-suite runs for various purposes; appreciated but more wanted

➤ ERA5 eagerly awaited

➤ Use of **Renewables** very common – exacting requirements (solar, wind mainly)

➤ **New precipitation type positive feedback** (though some related requests)

➤ Downscaling seasonal

➤ Use for short ranges relatively common now. For some aviation forecasters ECMWF output is the number one model tool.

➤ CDS interest

➤ Regime transitions

➤ Use for (TC) field campaign planning

Q2: Have you experienced any particular problems with ECMWF forecasts in the last 18 months (e.g. systematic errors/biases, one off bad forecasts)?

➤ Mixture of issues. Two main categories: systematic (or perceived systematic) and one-off bad forecasts

➤ Low cloud
   ➤ errors in base height; under and over-prediction of amounts, inland and near coasts. Marine inversion (and related cloud) too low - Israel.
   ➤ Too much cloud in summer convective situations (complicated by diurnal cycle errors)
   ➤ Inland Europe not enough St/fog
   ➤ Missing around Antarctica (sea ice leads provide moisture?)

➤ Precipitation
   ➤ Over-prediction biases at longer leads (e.g. Sweden, Iberia), but may not be real issue if period is anomalously dry
   ➤ Small totals too frequent (convective and stratiform)
   ➤ Convection issues: **lack of big totals**, including Africa at short range, **diurnal cycle errors**
   ➤ Spurious precipitation over lakes and coastlines in extra-tropics (45r1 better?)
   ➤ African lake regions – far too much rain (+daily temperature cycle lacks amplitude)
   ➤ Lack of inland penetration of convective
   ➤ Orographic under-estimated mostly, but can also be over-estimated (SE Alps)
   ➤ Repeated convective summer front issues over China, meso lows can "explode" into anomalous larger cyclones

➤ CAPE
   ➤ **Questions about method of computation**
   ➤ Some general dissatisfaction

Q2: Have you experienced any particular problems with ECMWF forecasts in the last 18 months (e.g. systematic errors/biases, one off bad forecasts)?

➢ Precipitation type
- ➢ **Freezing rain issues in specific cases**
- ➢ Forecast snow depths too high (mixed phase accumulation)
- ➢ **Snow not melting quickly enough**

➢ 2m Temperature
- ➢ Cooling impact of spurious snow cover
- ➢ Biases that vary with season
- ➢ **Summer Tmax systematically too low**
- ➢ ENS spread too low
- ➢ Miscell issues in China
- ➢ Spring heatwave, IFS playing catchup
- ➢ Miscellaneous local issues – eg Po Valley too cold

➢ Seasonal
- ➢ "Busts" reported
- ➢ Jumps reported

➢ Stratosphere
- ➢ Fundamental issue with stratospheric modelling (but task force in place)

Q2: Have you experienced any particular problems with ECMWF forecasts in the last 18 months (e.g. systematic errors/biases, one off bad forecasts)?

- ➢ 10m Wind
  - ➢ Convective gusts
  - ➢ Other miscellaneous gust issues
  - ➢ **Wind over mountains under-estimated**
  - ➢ Too windy at night
- ➢ Jumpiness
  - ➢ **Reported in many aspects!**
  - ➢ ENS slave behaviour
- ➢ Visibility
  - ➢ **Some general dissatisfaction**
  - ➢ Fog forecast over sea and nearby coasts where it is never reported
- ➢ Waves
  - ➢ Sig wave height too low (Portugal)
- ➢ Lakes
  - ➢ Constance and Geneva – SST issues
- ➢ Orography
  - ➢ Lacks detail (because has to be filtered for dynamics compatibility)

Q3: How could ECMWF improve the way it provides forecast data to users (e.g. new products/parameters, output to support warning issue and impact forecasting, technical issues, timeliness, cloud services)?

➢ **Provide 06 and 18Z BC Runs. Hourly data. 3-hourly to longer leads.**

➢ **Earlier delivery.** delay alerts.

➢ 15 minute data!

➢ Match NCEP pressure level data

➢ Bigger re-forecast dataset

➢ Hail product

➢ **Winds at other levels for turbines** (e.g. 50m, 80m, 200m)

➢ Regime-dependant climatologies (clickable)

➢ **More convective indices**

➢ **More aviation indices** (e.g. turbulence-related)

➢ Tile skin temperatures

➢ **Faster ecCharts access** (but system stability praised + one report of speed slightly better)

Q3: How could ECMWF improve the way it provides forecast data to users (e.g. new products/parameters, output to support warning issue and impact forecasting, technical issues, timeliness, cloud services)?

➤ **PV=1.5 level** data, and PV advection, and cyclonic vorticity advection

➤ **More Fire/Drought products**

➤ More EPSgram parameters

➤ Thermal front parameter

➤ Convective/stratiform division

➤ Precipitation duration

➤ Improved colour schemes / domain availability

➤ Tropical waves

➤ Convective cell steering parameter

➤ Integrated low level moisture (lowest 50mb or so?), for convection forecasting

➤ Seasonal velocity potential/stream function

➤ Monthly clickable for plumes

➤ Snow EFI for longer periods

➤ IVT EFI

Q3: How could ECMWF improve the way it provides forecast data to users (e.g. new products/parameters, output to support warning issue and impact forecasting, technical issues, timeliness, cloud services)?

➢ Better variable documentation

➢ Web anomaly charts to 6 weeks for monthly

➢ Tide/surge model

➢ Cloud services instead of transfer.

➢ 2Y graphical product archive

➢ Lagged ENS products

➢ Access to weekly weather discussion

➢ API access, to data on more levels (eg for wind turbines)

➢ Gridded ppn analyses

➢ Weather regime – TC links

➢ Conditional verification (e.g. relate to Alpine flow)

➢ Ocean model verification

➢ Point rainfall product

Q3: How could ECMWF improve the way it provides forecast data to users (e.g. new products/parameters, output to support warning issue and impact forecasting, technical issues, timeliness, cloud services)?

➢ More ENS training

➢ Touch-screen ecCharts

➢ More auxiliary fields in ecCharts (e.g. city names, rivers, …)

➢ Bigger fonts in ecCharts

➢ Replace a saved product in ecCharts

➢ Other pressure levels for omega, theta-w, theta-e in ecCharts

➢ Mechanisms for linking Meteogram parameters for given ENS members (not easy!)

➢ Different units for aviation purposes (km/h and feet)

➢ More soil moisture layers

➢ **Better MARS documentation**

➢ **Faster MARS access**

Q4: Are you developing or thinking of developing new and/or innovative products, if so what, and how could ECMWF help?

➤ Translating hazards into impacts

➤ Airspace capacity forecasts

➤ ENS prob of convective cloudiness

➤ Low level turbulence

➤ Sting jet feature ID

➤ Subsidies for NMS in tropical countries, to give access to ECMWF data

- B. What happens locally within your organisation if you detect a problem - e.g. a chart unavailable / model problem (eg Sea ice)? Do you contact ECMWF immediately, or later, or not at all? And what is the reason for this action?

➢ Products "disappeared" in autumn (CDB) – we were contacted, resolved

➢ Sea ice issues around Iceland – eventually contacted ECMWF, tricky to resolve

➢ Go to Service Desk

➢ **Efficiency of ECMWF dealing with issues was praised, and appreciated**