User requirements from SERCOM, particularly SC-DRR

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SC/DRR requirements and expectations
PLAN

- Improving models within the cascading approach

- Numerical Weather data access and availability

- Interoperability and support to the IBFWS chain in all time scale

- Risk-oriented deterministic & probabilistic key parameters

- Support and training

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Improving models within the cascading approach : Global + Regional + Local scales

- Improving numerical models on the 3 complementary scales (Global → Regional → National/Local) is crucial for risk forecast and anticipation.

  - Probabilistic approach through Ensemble and/or Multi models, including Ensemble available for meso-scale models
  - Own data assimilation process for meso-scale models (including regional/local data such as radar, local AWS, …) and not from the global coupled model only … if feasible (while recognizing that this process is highly demanding)
  - Better topography/coastal bathymetry representation
  - Ocean/atmosphere interaction

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Numerical Weather data access and availability

- There is already numerous (often far enough ?) numerical weather products but …

  - Access to numerical data, instead of graphics, is still a challenge including for regional centers who wish to
    - → tailor products with regards to their specific regional commitment
    - → avoid confusion in interpretation when display / thresholds / parameters are often different from a provider to another
    - → develop post-process, ML/AI algorithms and (semi) automated products at regional level

  - Access is generally quite demanding in terms of telecom/internet/bandwidth resource
    - → recommendation to generalize user friendly web services

  - Harmonized format is crucial for interoperability and working environment

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Interoperability of NW data and support to the IBFWS chain for "all" time scale

- Interoperability of NW data for smart and efficient modelling chain for all time scale
  - Combination of slow-onset hazard with rapid developing / short term threat
  - From rainfall intensity/amount ... to river flow ... to flash flood/inundations , From wind/waves ... to wave set-up/wave run-up at coast ... to marine submersion

  → How to improve interoperability at regional and national/local level ?

- Calibrated post-processed products

  - thresholds/index exceeding, quantiles/percentiles, etc.   that could (almost) directly contribute to initialize table of risks, thanks to ML/IA calibration (at regional/national level)

- Knowledge of verification and bias

  - For relevant "final"parameters such as max gusts, accumulated rainfall, H1/3 waves and peak periods, ...
  - For confidence and credibility of scenarios
  - For intensity assessment and support to impact based paradigm (EPS envision 20mm in 6h over a small island = how much might we expect ?)

  → How to convey this type of information ?

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Risk-oriented deterministic & probabilistic key parameters

* Note : in addition to what is already available and spelled out in GDPFS documents

- ## Other key deterministic parameters
  – Harmonization of parameters that should "represent/track" something similar : Théta e VS Théta'W
  – Precipitable water content
  – Upper tropospheric dynamics trackers
    → Jet streak convergence/divergence, PV at pertinent level / threshold region/latitude specific, …
  - Synoptic waves (MJO, Kelvin, …) "user friendly" trackers

- ## Enhancement of probabilistic products availability
  – spatialized probabilities, anomalies and EFI on rainfall (all kind of accumulation … from 1h to monthly), wind (mean wind, gust), waves (height, period), air quality , …(more parameters, spatial and temporal resolution, multi-models approach, index (cf next point))
  – Risk-oriented epsgrams with flexibility in the content (WEB service access to design the content)

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Risk-oriented deterministic & probabilistic key parameters

- Risk-oriented index
  - Heat wave and frost index … combining temperatures, moisture and wind … for medium range/monthly forecast
  - Wild fire risk Index … to qualify/quantify how the environment is favorable
  - Convection / Thunderstorm probabilistic index , combining Cape, Cin, Helicity, …
  - Fog index

  Region specific
  - Sargassum : Ocean surface current analysis and forecast to be combined with wind/wave (like for "drifting models")
  - Dust storm and Saharian Air Layer tracker (coupling with aerosols transportation models ?)

- Contribution to qualify confidence in scenarios : (Examples)
  - Ensemble/multi-models "spread index";
  - How the deterministic is positioned within the ensemble members ?
  - Products/parameters (differences) that can show changes or consistency from one run to another

  * Note : the newly formed AG-SWF (1st meeting august 18 2022) could be a good interlocutor to better detail request/expectations for risk-oriented parameters

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Severe Weather Forecasting (SWF) Activity

- RSMCs SWF

  - Currently RSMCs SWF mainly provides 'Guidance' for three hazards only i.e. 'Heavy rain' Strong wind' and 'High waves'

  - Several of the RSMCs SWF are willing to provide 'Guidance' for additional hazards (e.g. thunderstorms (TS), local dust storms (DS), heat/cold waves, forest/wild fires etc. as/if applicable and feasible) subject to availability of additional NWP and derived products from the GDPFS Centres as/if feasible (confirmation of previous slides)

    → *TS related products and indices, model guidance from DS advection model, heat wave index, wild/forest fire index, ignition temperature for different types of forests, etc.*

  - In some case RSMCs SWF and RSMCs limited-area NWP are co-located and this is of great help and opportunity to improve SWF use of NWD and regional guidance.

- Requested amendments of the GDPFS Manual ([WMO-No.485](#))

  - **Appendices 2.2.1 (Global deterministic NWP) & ensemble & 2.3.5 (Global ensemble NWP)**

  + Appendices 2.2.3 (LAM deterministic NWP) & ensemble & 2.3.7 (LAM ensemble NWP) may be amended as/if feasible in terms of model resolution, forecast range and frequency.

    - 'Highly recommended' products may be added to the list of 'mandatory' products.

    - Additional products related to risk-oriented parameters and indexes as mentioned in the previous slides may be added in the 'highly recommended' products as appropriate and feasible.

    - Digital NWP high-res LAM data may be shared with the RSMCs SWF for developing valued added products

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Focus on Tropical Cyclones

- The current GDPFS Manual ([WMO-No.485](#)) indicates that "Tropical storm tracks (latitudinal/longitudinal locations, maximum sustained wind speed, MSLP)" are an "**additional recommended product**".

- Effective use of the NWP track data is vital not only for RSMC/TCWC but also for NMC
  - → **SC/DRR Advisory Group on Tropical Cyclones (AG-TC)** recommends (AG-TC-2, 7-9 June 2022) that Appendices 2.2.1, 2.2.3, 2.2.5, and 2.2.7 of the GDPFS Manual be amended
    - to ensure that the track data provided by the NWP Centres are available **with additional parameters and easy-to-use formats**.
  - · Parameters: latitudinal/longitudinal locations, maximum sustained wind speed, minimum sea level, pressure, quadrant radii of 34, 50 and 64 kt winds, and radius of maximum winds.
    - to classify this tropical cyclone tracks output of deterministic and ensemble of both global and limited-area NWP models **as mandatory data**.

- Output from the recently conducted questionnaires to TC RSMCs and TCWCs under the **WWRP TC-PFP** project* :
  - TC RSMCs/TCWCs rely heavily on **bilateral agreements, the Internet,** and **other agencies** for acquisition of TC tracking data, rather than on GTS.
  - There are significant differences in the data being (or being able to be) acquired by each centre.
  - The different centres have different acquisition times for the same data.
  - → **These results strongly support the above recommendation from AG-TC about the improvement in access to TC tracking data, which are essential for their operations.**

* Project led by World Weather Research Programme (**WWRP**) in collaboration with **SERCOM** (e.g., Tropical Cyclone Programme; **TCP**) and **INFCOM** (e.g., Standing Committee on Data Processing for Applied Earth System Modelling and Prediction; **SC-ESMP**), launched in response to recommendations from the 9th WMO International Workshop on Tropical Cyclones in 2018, and approved as a **Seamless GDPFS Pilot Project**.

→ Main goal : identifying best practice guidance for probabilistic tropical cyclone forecasts and fostering Research-to-Operations transfer for better forecast services

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Knowledge transfer, support and training

- How can regional/national/local forecast offices take the best from NWP and GDPFS through support and training ?

  - Knowledge
    - What is currently available from providers (WMC and Regional Centers) ?
    - Models principles, updates (impact of changes) and verifications
    - Boundary condition and forcing for meso-scale models

  - Working methodologies and tools
    - How to best combine deterministic products and ensemble/multi-models products … taking into account the limitations of each
    - Meteorologists working on short to medium terms forecasts are often not the same than those working on monthly/seasonal forecasts (more related to climatology)
    - Interoperable environment … from nowcasting integrated tools to seasonal forecast oriented systems

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Human added value on NWP

- Human expertise is crucial to produce regional risk-guidance from NWP at RSMC
- Human expertise on NWP is also crucial at national level for MHEWS activities

Thank you
Merci

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