



Supplement of

Predictability of extreme surface weather associated with Mediterranean cyclones in ECMWF ensemble forecasts – Part 1: Method and case studies

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S1 Extreme precipitation and surface wind gusts

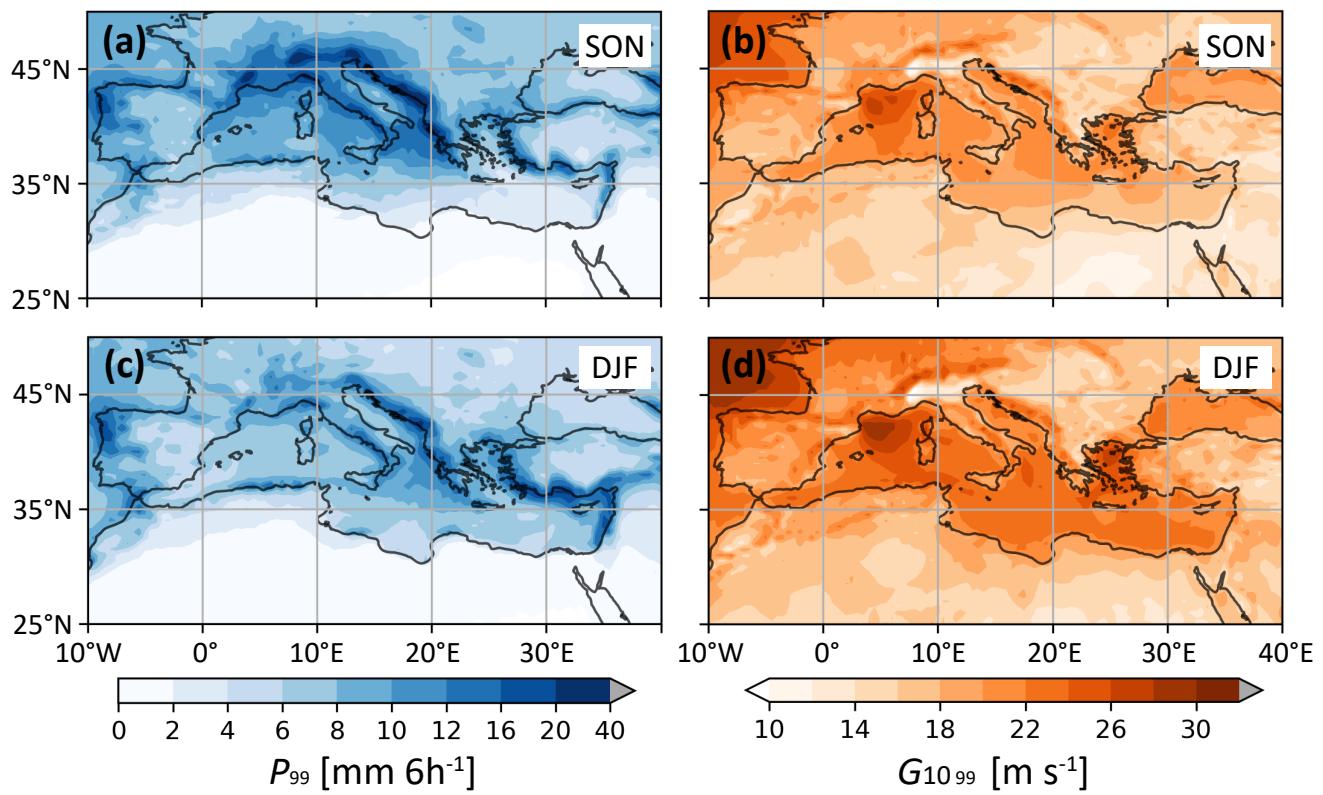


Figure S1. Seasonal 99th percentile in (a,b) SON and (c,d) DJF of (a,c) 6-hourly accumulated P (P_{99} , in mm 6h^{-1}) and (b,d) maximum 10m gust within a 6-hour period G_{10} ($G_{10,99}$, in m s^{-1}).

S2 Conditional probabilities of attributed extreme surface weather

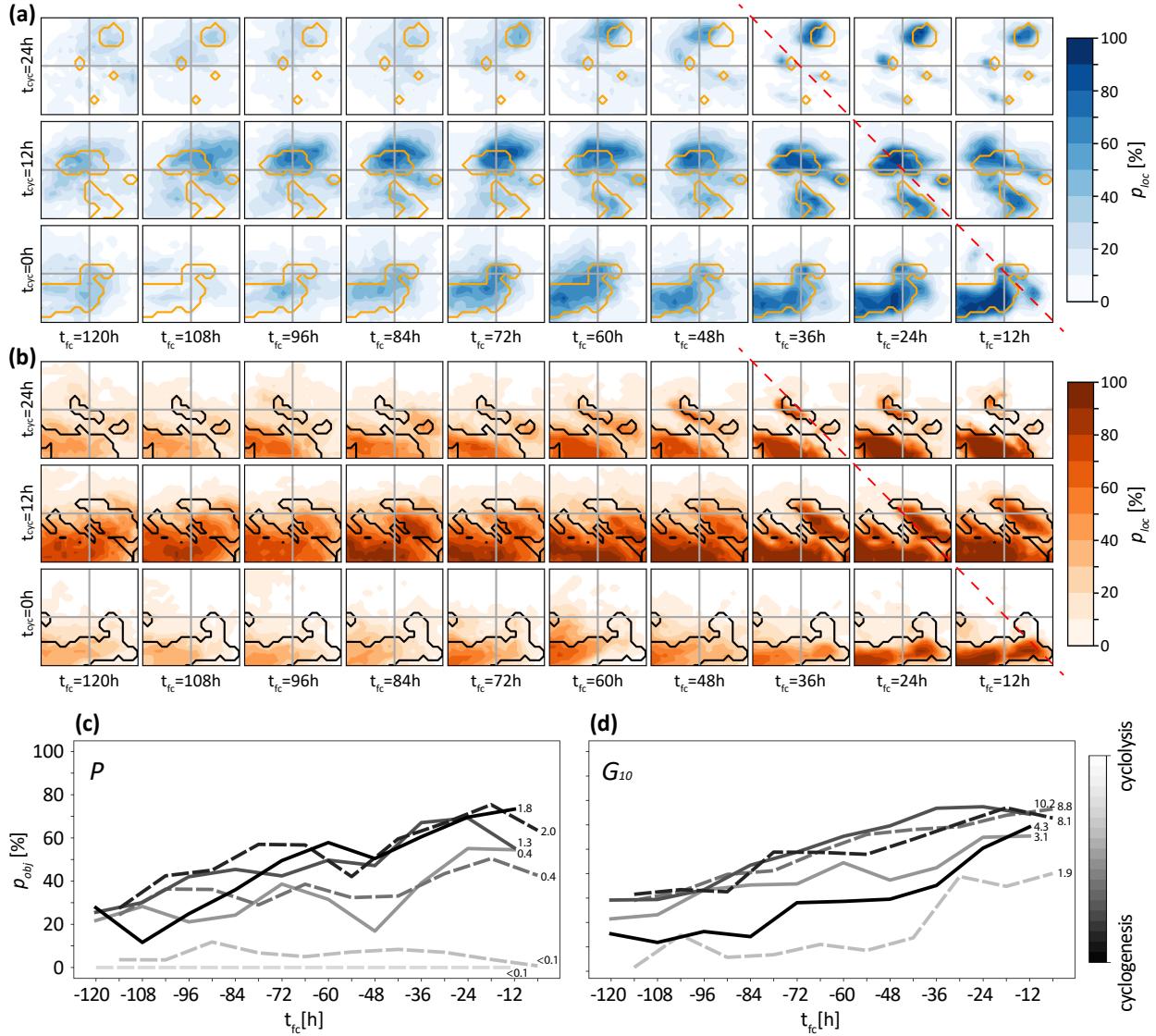


Figure S2. **(a, b):** Cyclone-centered probabilities (p_{loc}) of extreme objects of **(a)** P (blue shading) and **(b)** G_{10} (orange shading) during Storm Denise in ENS (in %). The orange line in (a) and black line in (b) denote the extreme P and G_{10} objects in ERA5, respectively. Lead time decreases along the x-axis (t_{fc} ; panels every 12 h) and time along the ERA5 cyclone lifecycle increases along the y-axis (t_{cyc} ; with cyclogenesis at $t_{cyc} = 0$ h). Composites from the same ENS forecast are positioned diagonally as illustrated by the red dashed line. **(c, d):** Average probability (p_{obj}) of extreme **(c)** P and **(d)** G_{10} within ERA5 objects as a function of forecast lead time. Each line denotes a separate time along the cyclone lifecycle from cyclogenesis (black line) to cyclysis (light grey line). Solid lines represent time steps shown in panels **(a)** and **(b)** above, other time steps are shown as dashed lines. The area size of the ERA5 object is indicated for each time step as a multiple of 10^5 km^2 next to the lines. In **(c)** and **(d)** cyclone time steps are shown every 6 h for time steps with identified extreme objects in ERA5. Further note that compared to Fig. 10 shown in the main part, this figure shows *conditional* probabilities, averaging only over members that have a matching cyclone track at a given time step.

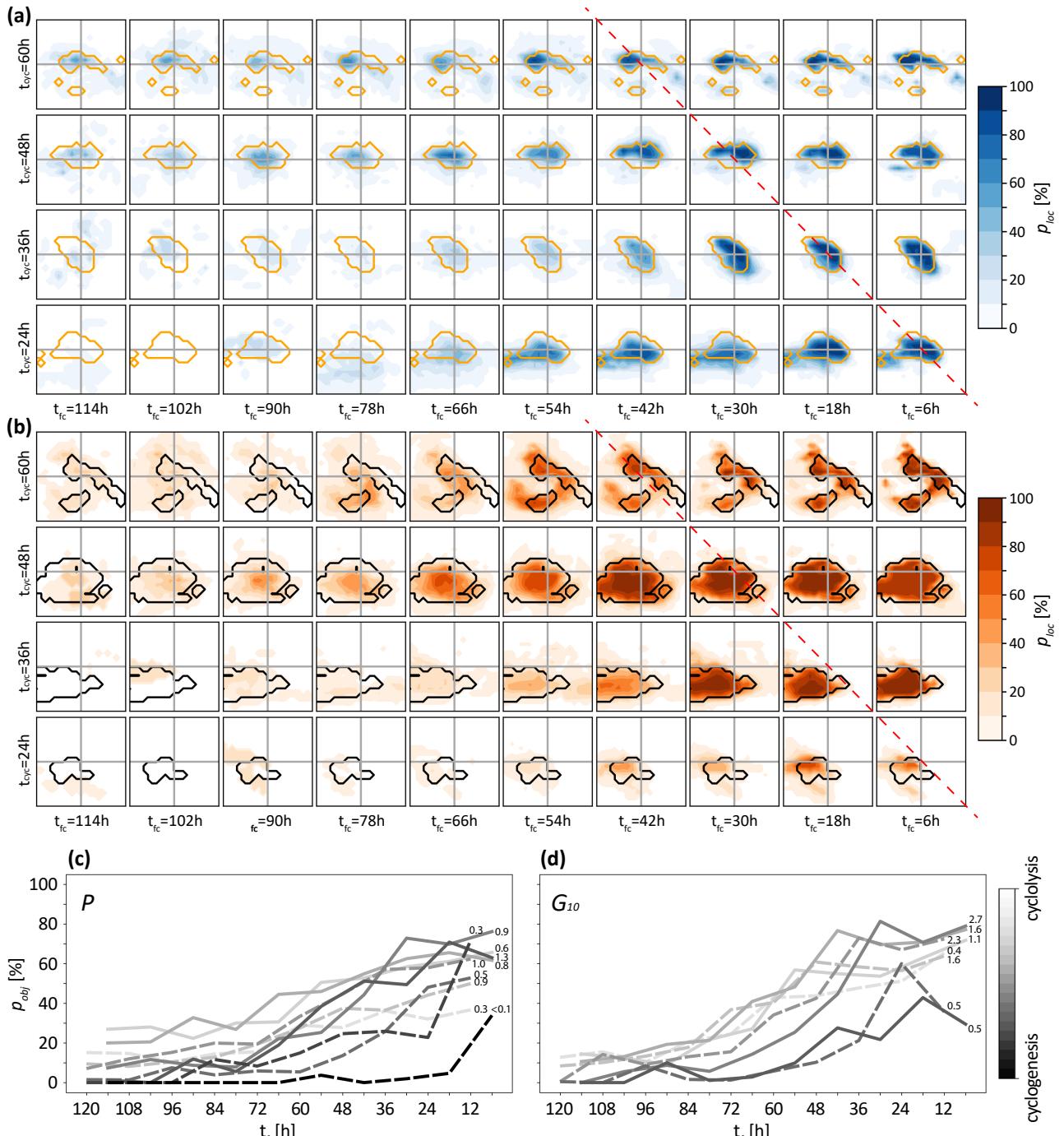


Figure S3. Same as Fig. S2 but for Storm Jan. Compared to Figs. S2 and S4, the values for t_{fc} in **(a, b)** are shifted by 6 h since the cyclogenesis of Storm Jan happened at 18 UTC and, thus, forecasts are available for lead times of 6 h, 18 h, 30 h, etc.

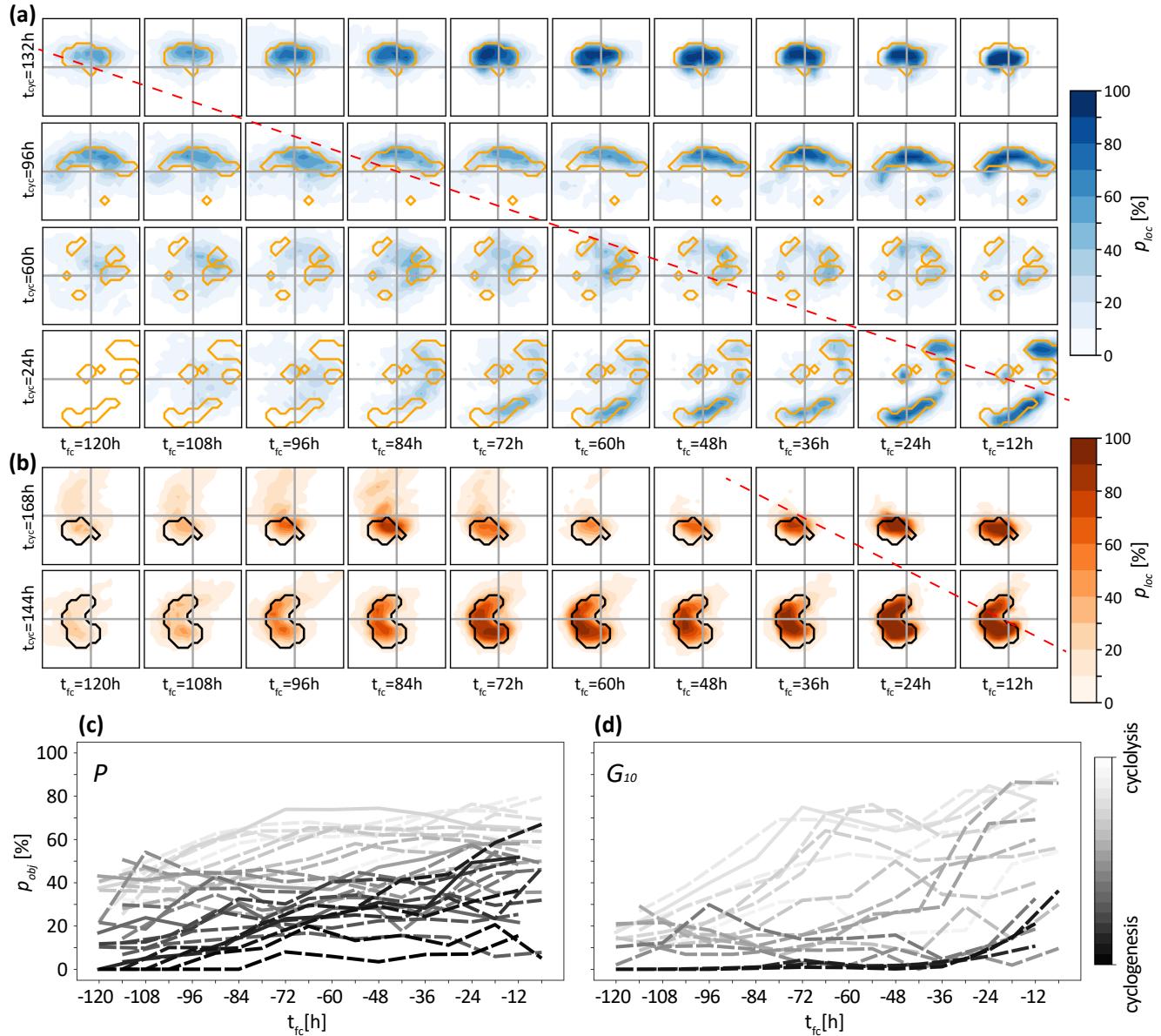


Figure S4. Same as Fig. S2 but for Storm Daniel. Note that different time steps along the cyclone life cycle are shown for objects of P and G_{10} .