



*Supplement of*

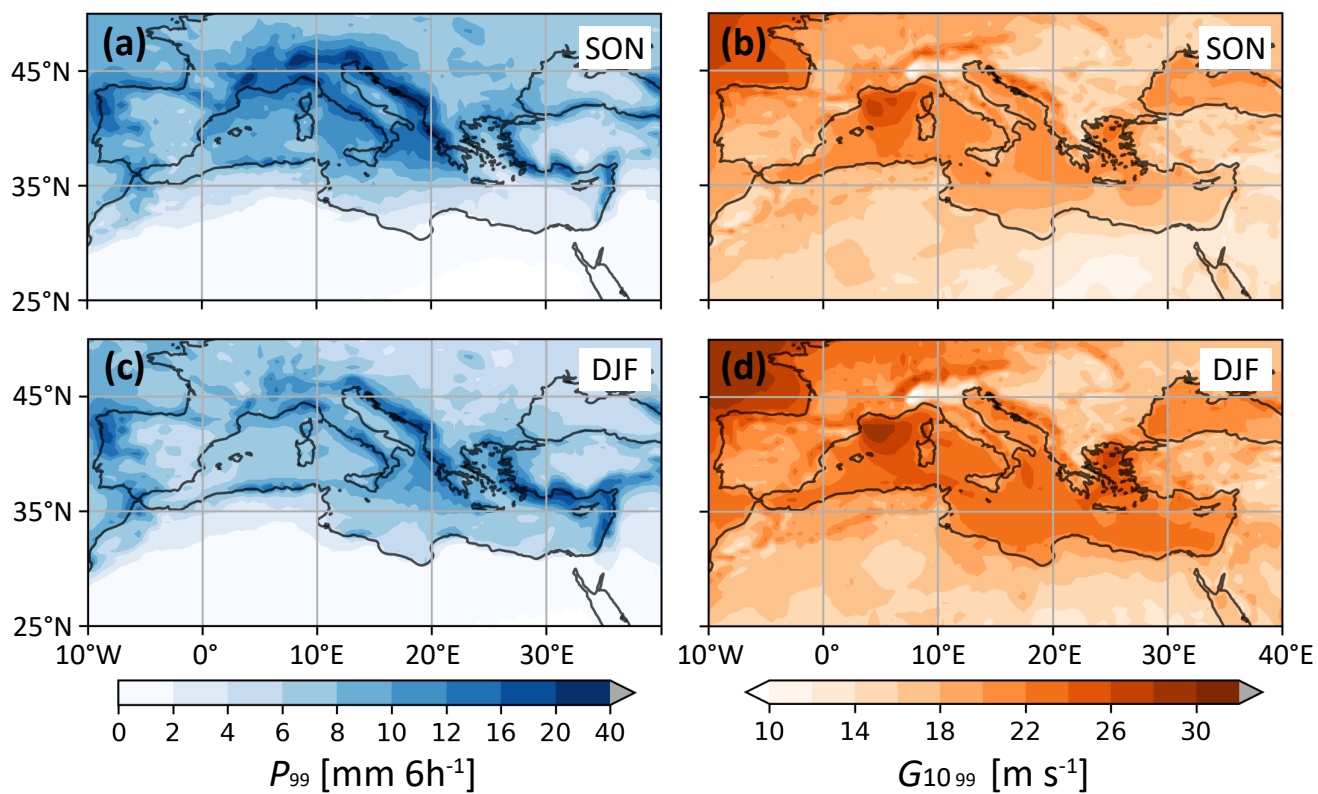
## **Predictability of extreme surface weather associated with Mediterranean cyclones in ECMWF ensemble forecasts – Part 1: Method and case studies**

**Katharina Hartmuth et al.**

*Correspondence to:* Katharina Hartmuth ([katharina.hartmuth@env.ethz.ch](mailto:katharina.hartmuth@env.ethz.ch))

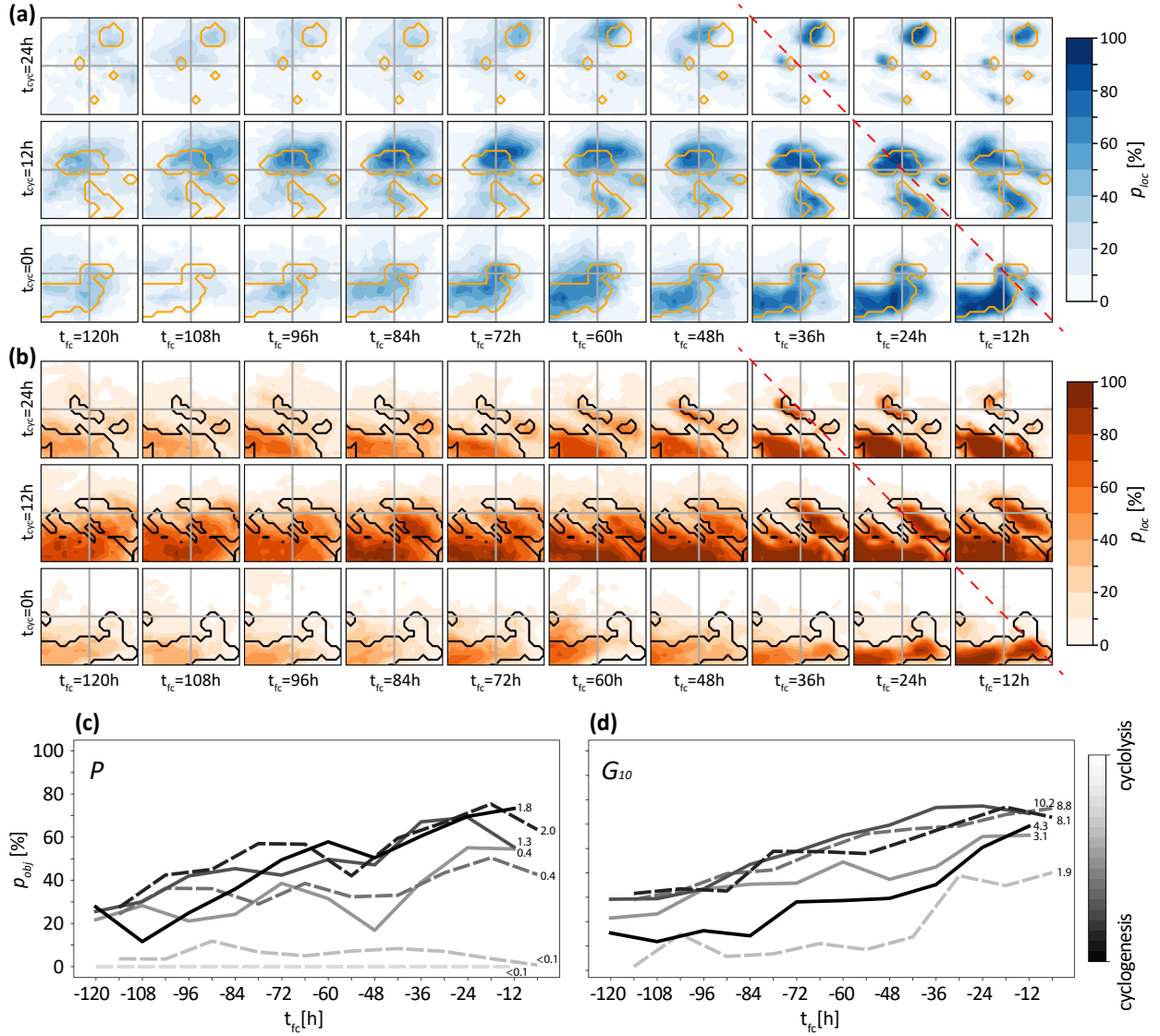
The copyright of individual parts of the supplement might differ from the article licence.

# S1 Extreme precipitation and surface wind gusts

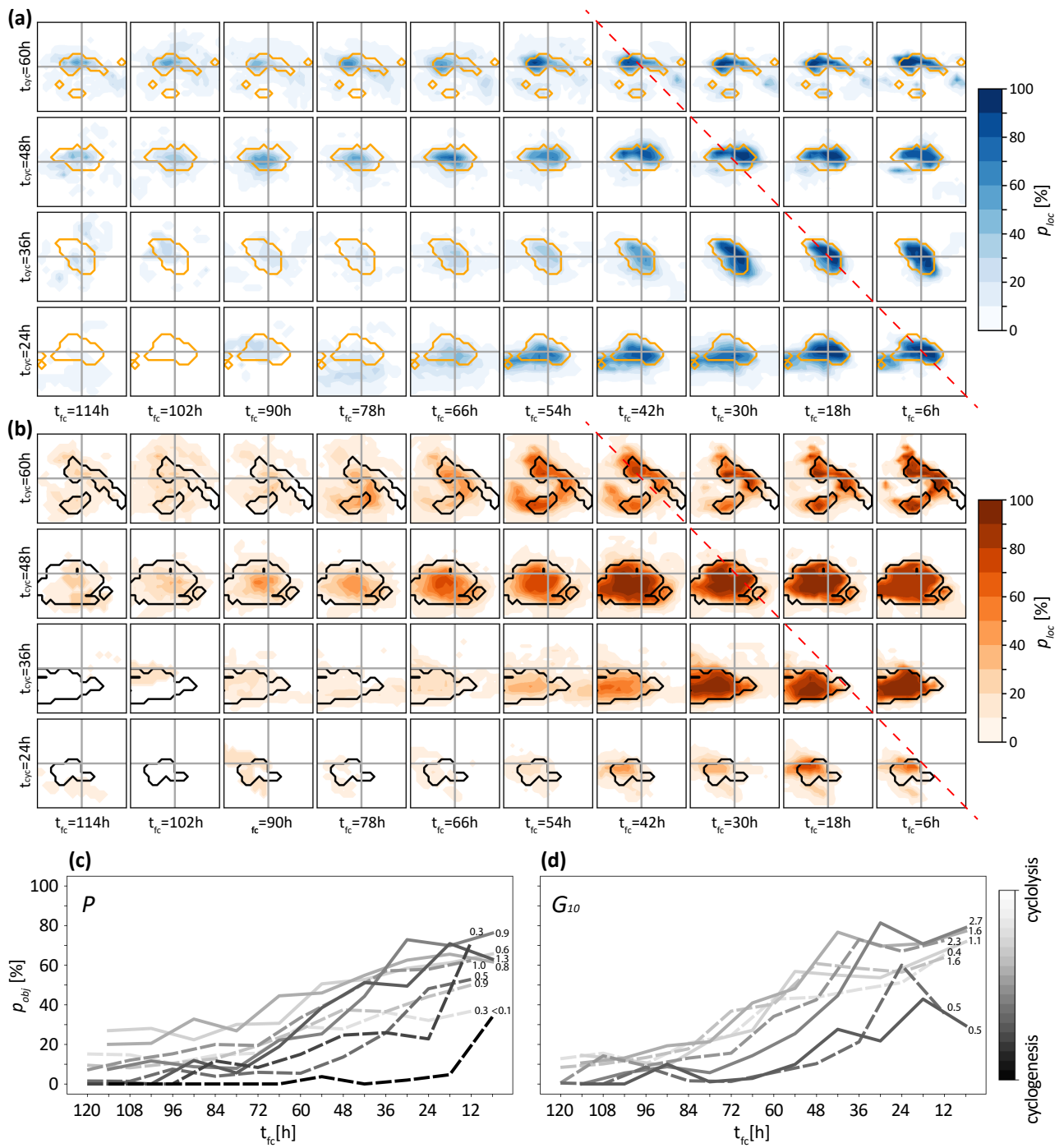


**Figure S1.** Seasonal 99th percentile in **(a,b)** SON and **(c,d)** DJF of **(a,c)** 6-hourly accumulated  $P$  ( $P_{99}$ , in mm 6 h<sup>-1</sup>) and **(b,d)** maximum 10 m gust within a 6-hour period  $G_{10}$  ( $G_{10,99}$ , in m s<sup>-1</sup>).

## S2 Conditional probabilities of attributed extreme surface weather

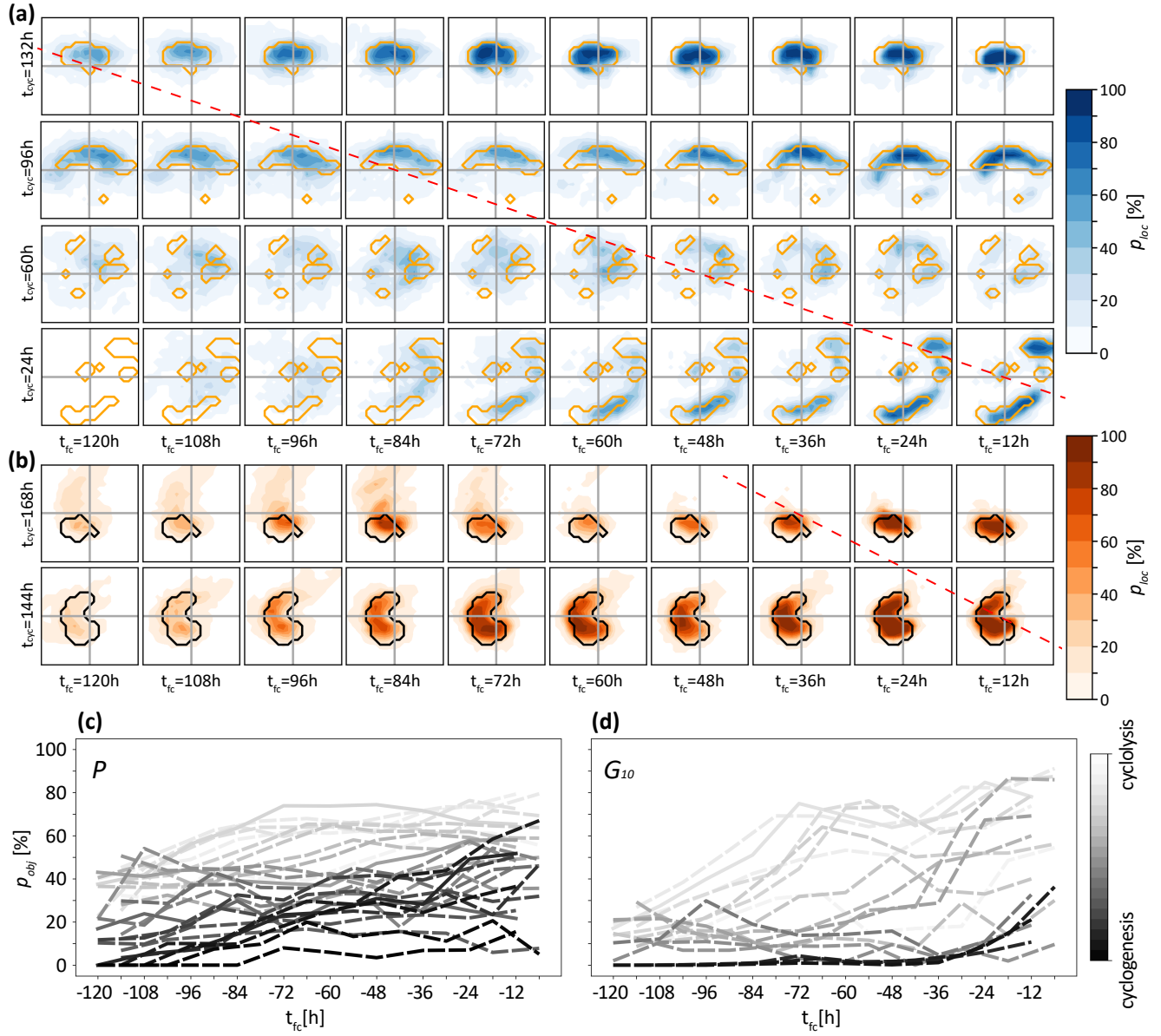


**Figure S2.** (a, b): Cyclone-centered probabilities ( $p_{loc}$ ) of extreme objects of (a)  $P$  (blue shading) and (b)  $G_{10}$  (orange shading) during Storm Denise in ENS (in %). The orange line in (a) and black line in (b) denote the extreme  $P$  and  $G_{10}$  objects in ERA5, respectively. 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 cyclolysis (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  $10^5 \text{ km}^2$  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  $G_{10}$ .