

# Synoptic and Dynamical Characteristics of High-Impact Storms Affecting the Iberian Peninsula during the 2018–2021 Extended Winters

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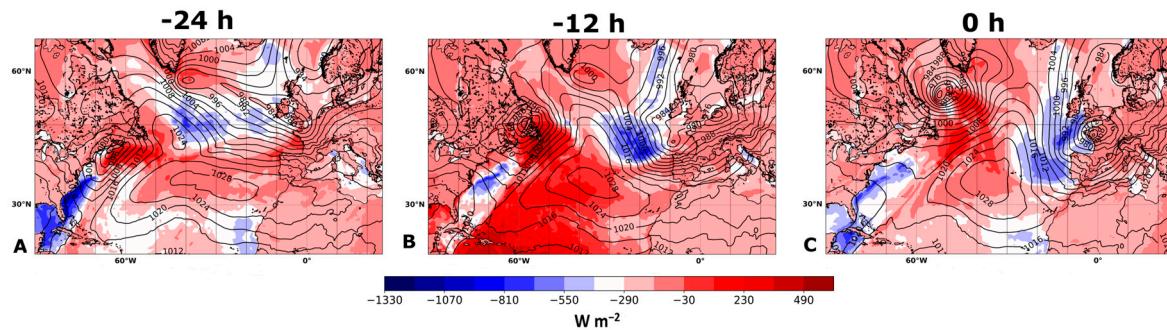
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To identify the events with explosive development, the deepening rates of the core pressure for 24 h were analyzed for each storm and then geostrophically adjusted to the reference latitude of 60°N (see equation 1) and classified according to Sanders [77] (equation 2). Furthermore, a definition modified by Zhang et al. [78] was also used to analyze and classify the ECs. The results are presented in Table S1.

**Table S1.** High-impact storms with explosive development.

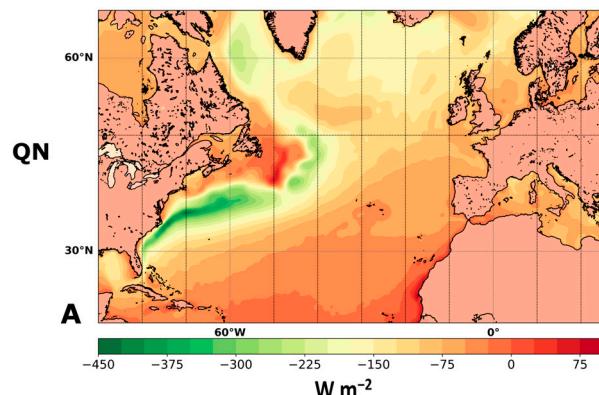
High-impact storm with explosive development	Core pressure deepening rate (hPa/24h)	Geostrophic adjustment to reference latitude 60 °N (hPa/24h)	1 bergeron = $(24 \text{ hPa}/24 \text{ h}) \times \sin 60^\circ / \sin \varphi$	Sanders [77] Classification	Deepening rate (DR in Bergeron)	Zhang et al. [78] Classification n
2017-2018						
Ana	29	33.8	1.17	Weak	1.74	Strong
Emma	34	43.17	1.15	Weak	0.78	Weak
Hugo	37	42.46	1.00	Weak	2.28	Strong
2018-2019						
Gabriel	28	33.16	1.18	Weak	1.43	Moderate
2019-2020						
Elsa	30	32.97	1.06	Weak	1.01	Weak
Fabien	23	27.69	1.15	Weak	1.59	Moderate
Jorge	32	33.83	1.04	Weak	1.38	Moderate
2020-2021						
Alex	38	43.6	1.15	Weak	2.16	Strong
Dora	30	32.97	1.10	Weak	1.46	Moderate
Gaetan	30	31.33	1.02	Weak	1.07	Weak

### QN and MSLP

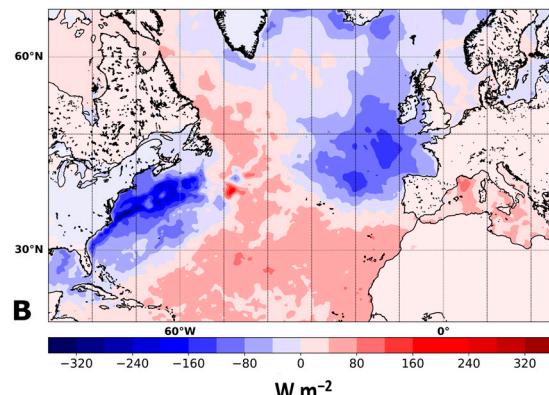


**Figure S1.** Analysis of the Net surface heat flux ( $Q_N$ ) ( $\text{W m}^{-2}$ ) for storm Ana at 24 hours (A) and 12 hours (B) before the instant of maximum intensity (0 h) (C). MSLP (black contours at intervals of 4 hPa) is plotted in all figures.

### Climatology of 1991-2020



### Anomaly - all events



**Figure S2.** Climatology for extended winter months (ONDJFMA) of 1991-2020: (A) Net surface heat flux ( $Q_N$ ) ( $\text{W m}^{-2}$ ). Anomaly for the composite of 2017-2021 extended winter storms (28 events): (B)  $Q_N$  ( $\text{W m}^{-2}$ ).