



*Supplement of*

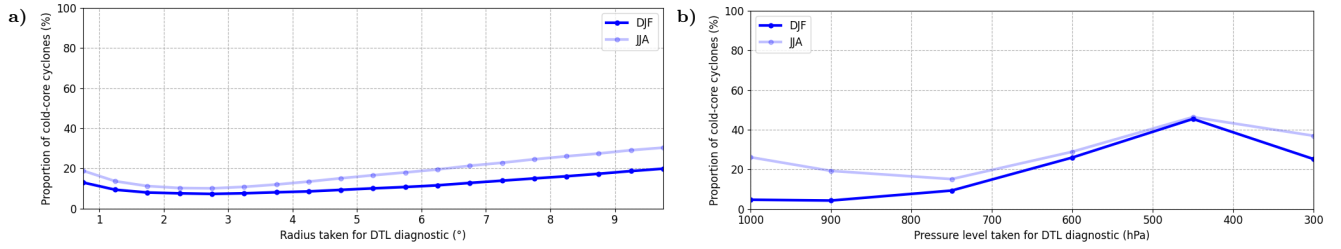
## **A cyclone phase space dedicated to extratropical cyclones**

**Myriam Besson et al.**

*Correspondence to:* Myriam Besson ([myriam.besson@lmd.ipsl.fr](mailto:myriam.besson@lmd.ipsl.fr))

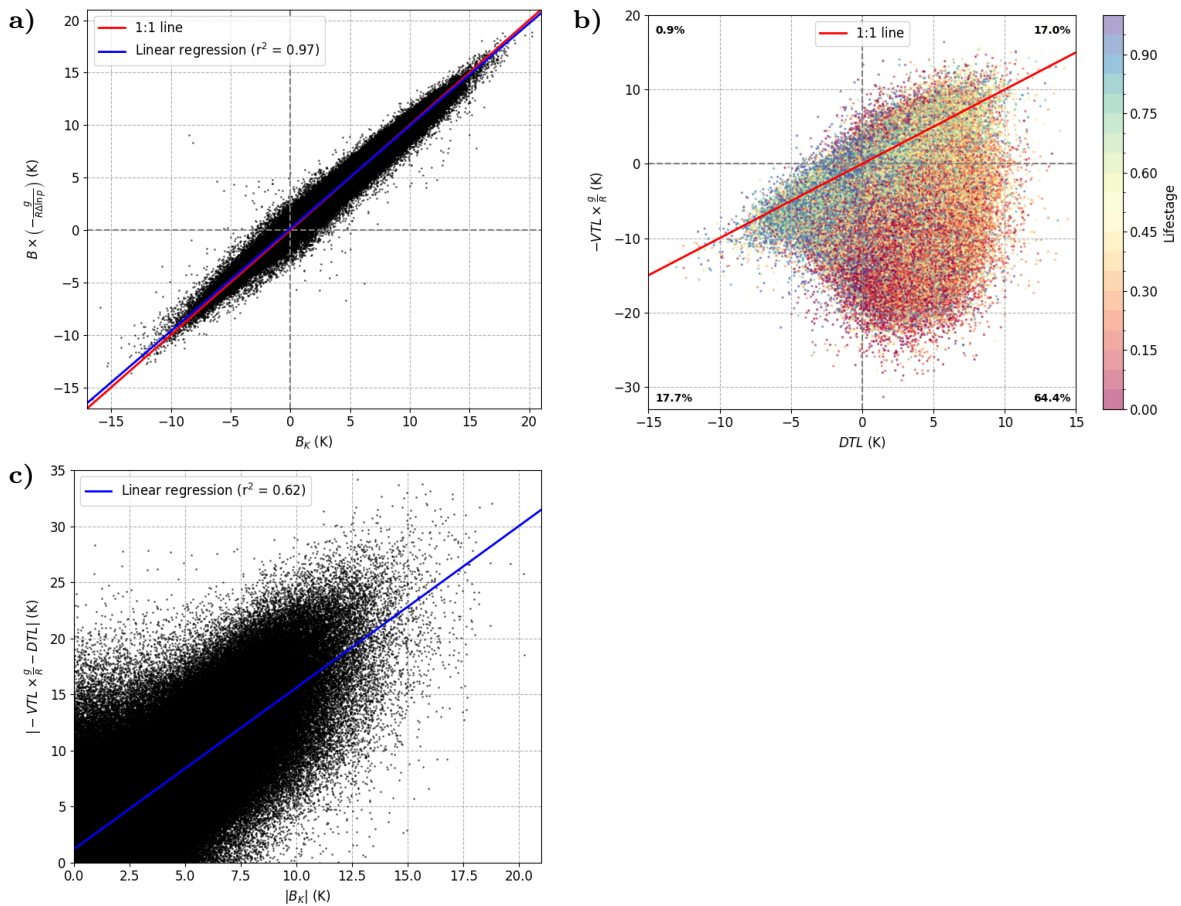
The copyright of individual parts of the supplement might differ from the article licence.

## S1. Sensitivity of the proportion of cold-core cyclones



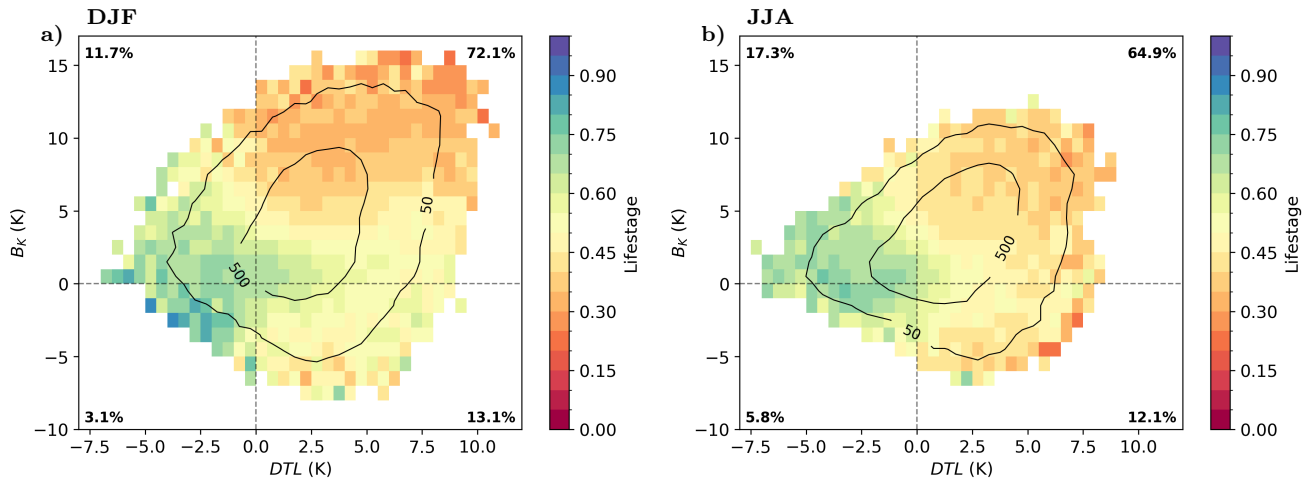
**Figure S1.** Percentage of cold-core cyclones identified for (a) different radii and (b) different pressure levels in the *DTL* definition.

## S2. Statistical analysis of differences between $B/B_K$ and $-VTL/DTL$



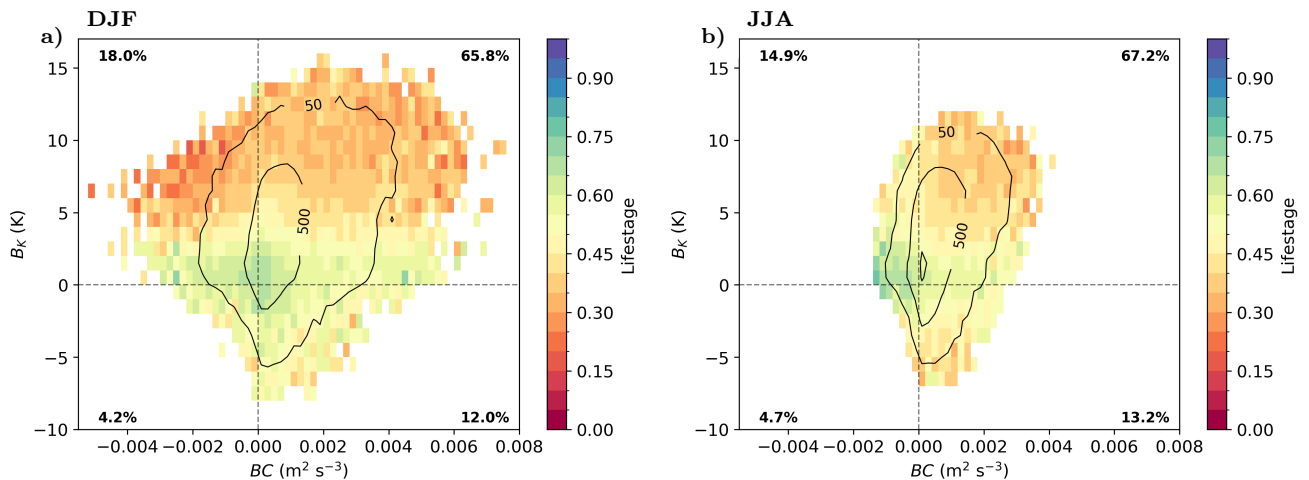
**Figure S2.** (a) Comparison between  $B_K$  and a scaled  $B$ . The linear regression is plotted in blue and the line  $B = B_K$  in red. (b) Comparison between  $DTL$  and a scaled  $-VTL$ . The line  $-VTL = DTL$  is plotted in red and the shading represents the lifestage. (c) Absolute values of differences between scaled  $-VTL$  and  $DTL$  as a function of absolute values of  $B_K$ . The linear regression is plotted in blue.

### S3. Seasonal $B_K$ vs. $DTL$ diagrams



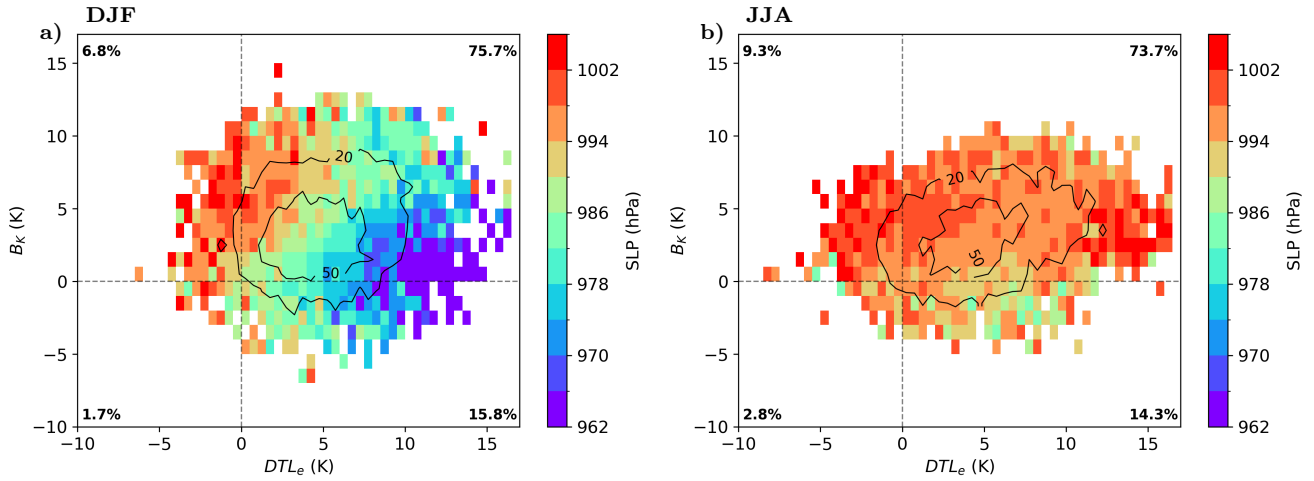
**Figure S3.**  $B_K$  vs.  $DTL$  diagrams for (a) DJF and (b) JJA. The diagrams are made with all track points. Shading indicates the mean lifestage in each small square. Black contours indicate the density of points. Four regions are built with gray lines of value 0. The percentages of data points in each region are indicated in the corners. Rectangles with less than 10 data points were removed for visualization but not in the percentages.

### S4. Seasonal $B_K$ vs. $BC$ diagrams



**Figure S4.**  $B_K$  vs.  $BC$  diagrams for (a) DJF and (b) JJA. The diagrams are made with all track points. Shading indicates the mean lifestage in each small square. Black contours indicate the density of points. Four regions are built with gray lines of value 0. The percentages of data points in each region are indicated in the corners. Rectangles with less than 10 data points were removed for visualization but not in the percentages.

### S5. Seasonal $B_K$ vs. $DTL_e$ diagrams

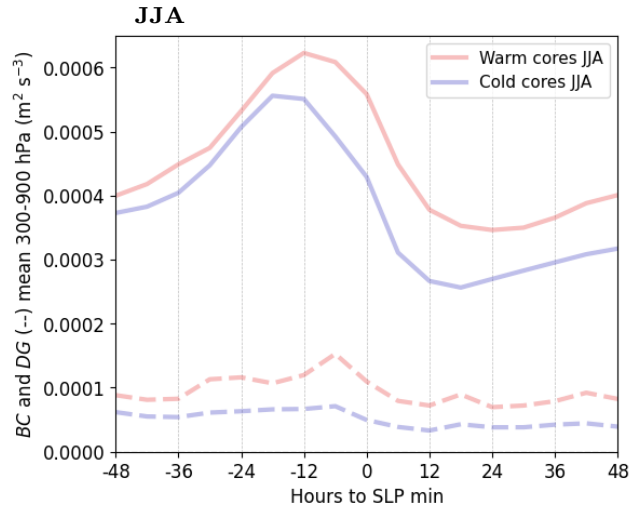


**Figure S5.**  $B_K$  vs.  $DTL_e$  diagrams for (a) DJF and (b) JJA made with track points at the time of SLP minimum only.  $DTL_e$  is defined as  $\theta_{e,C} - \theta_{e,B}$ . Shading indicates the mean value of SLP in each small rectangle (hPa). Black contours indicate the density of points. Four regions are built with gray lines of value 0. The percentages of data points in each region are indicated in the corners. Rectangles with less than 3 data points were removed for visualization but not in the percentages.

5

### S6. Relative importance of different terms in the evolution of $ETE$

In Appendix B is demonstrated that the evolution of  $ETE$  is a function of the baroclinic conversion  $BC$  and the diabatic generation  $DG$ . These terms are plotted in Fig. S3.



**Figure S5.** Lagged composites of mean  $BC$  (plain) and mean  $DG$  (dotted) on a  $10^\circ$ -radius circle and on the layers between 900 and 300 hPa. Transparent red lines correspond to JJA warm-core composites, transparent blue to JJA cold-core ones.