

## Additional Figures

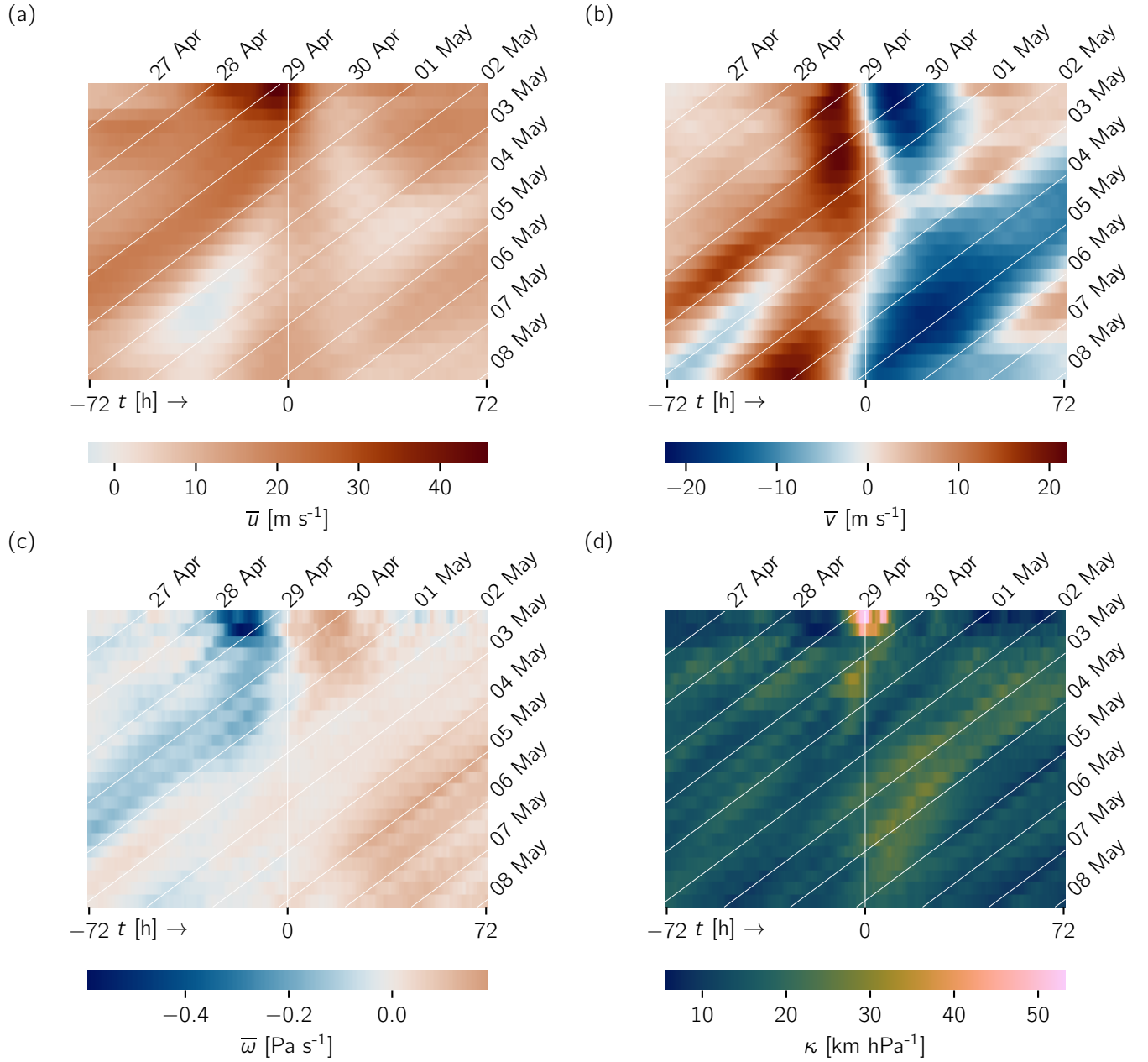


Figure S1: (a) & (b) mean average horizontal velocities, (c) average vertical velocities and (d) average  $\kappa$  plotted as a function of initialization time (24 initializations, vertical axis) and time step (144 time steps from -72 h to +72 h, horizontal axis) for the Canada 2016 case. White diagonals indicate isochrones (all 00 UTC). Vertical white line indicates initialization time.

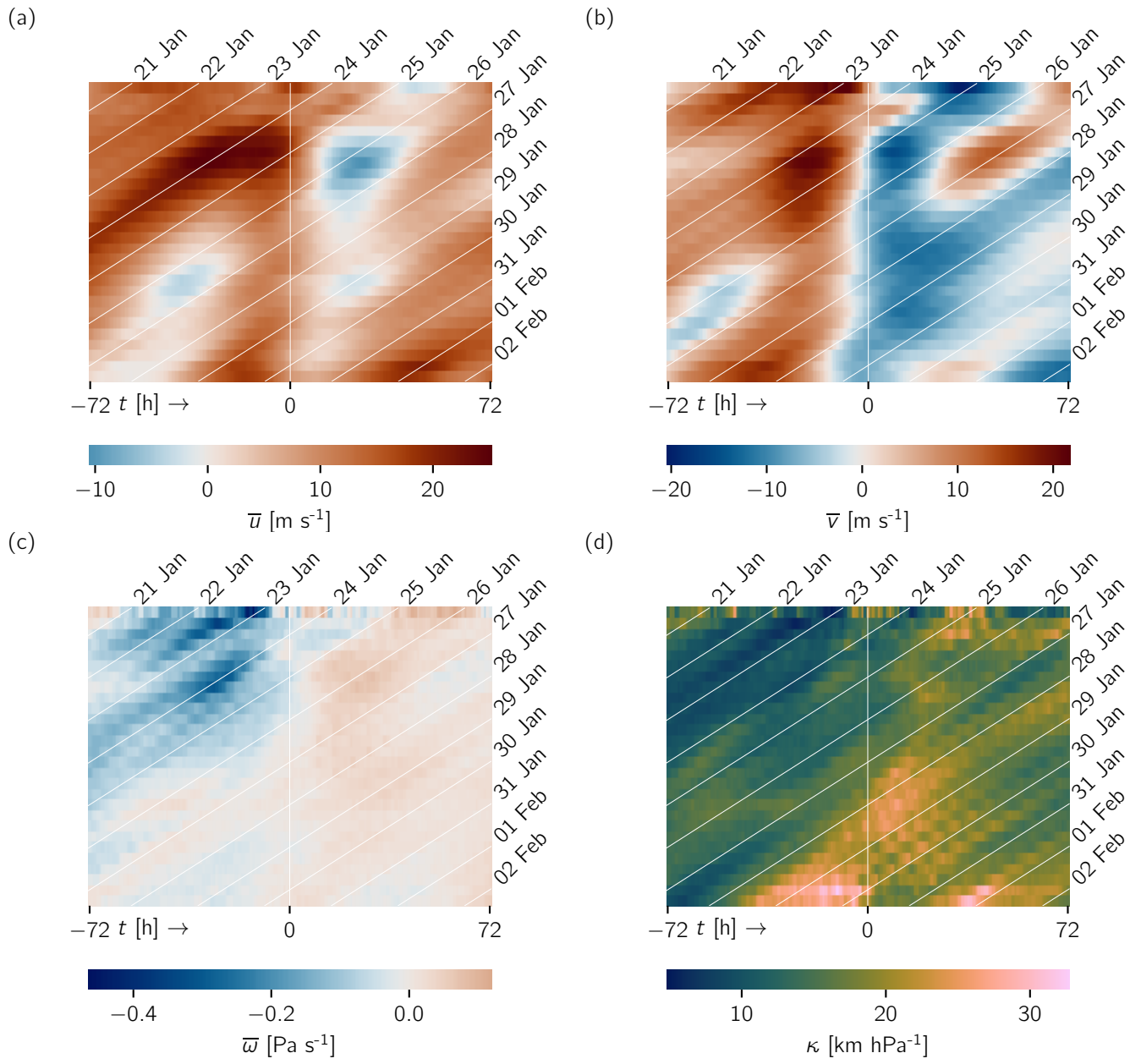


Figure S2: Same as Fig. S1, but for the 2017 Northern Europe case.

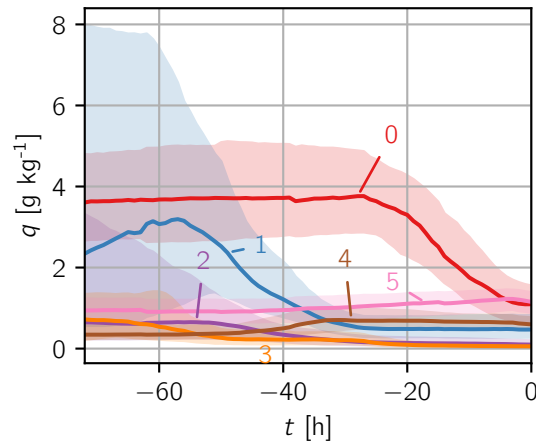


Figure S3: (a): Median (line) and interquartile range (shading) of specific humidity distribution among individual clusters from Fig. 5. Boundary point cluster (gray) not shown.

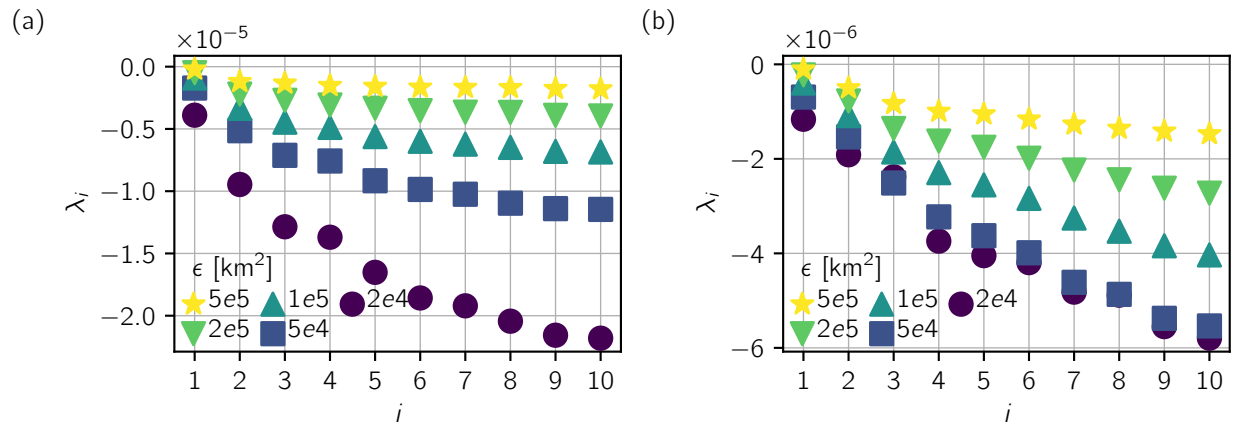


Figure S4: 10 largest eigenvalues of  $L_\epsilon$  for various values of  $\epsilon$  for trajectories initialized at (a) 04 May 2016 00 UTC and (b) 26 January 2017 18 UTC.