Sensitivity of block Thor to changes in upstream latent heating

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Many thanks to
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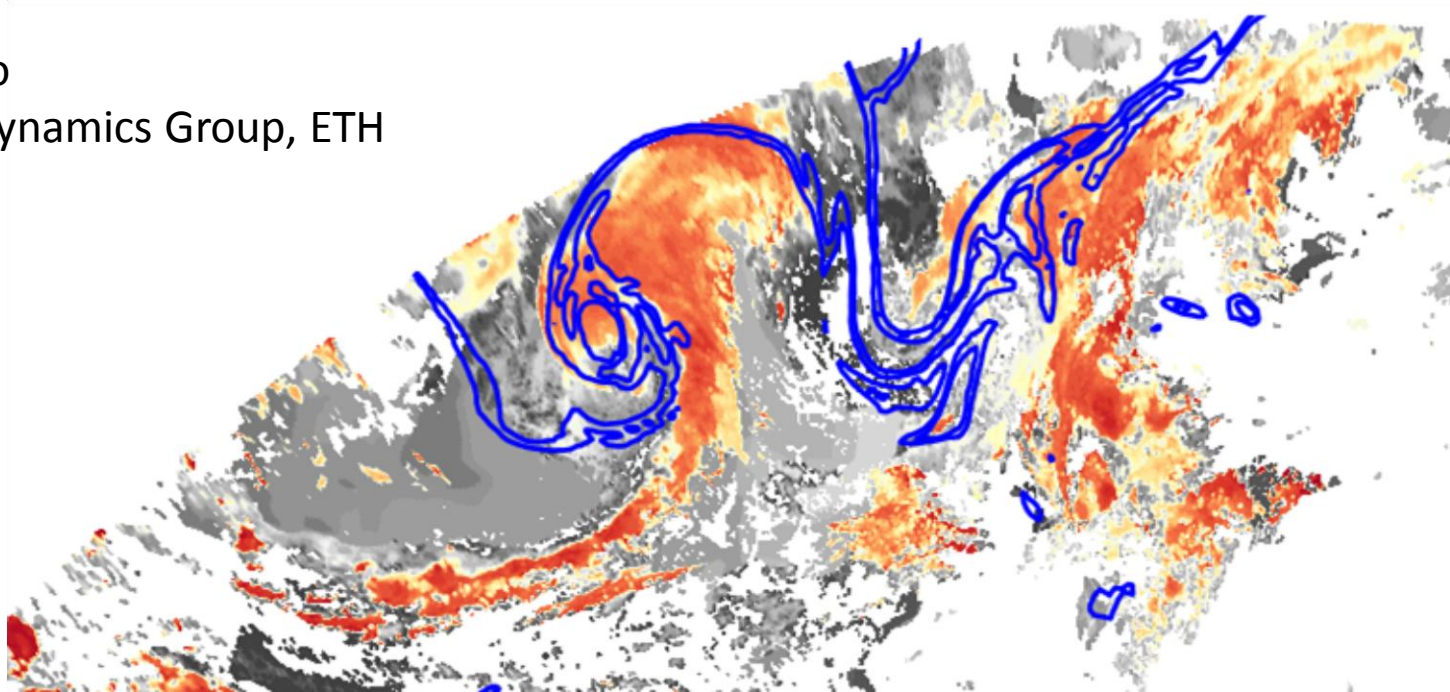
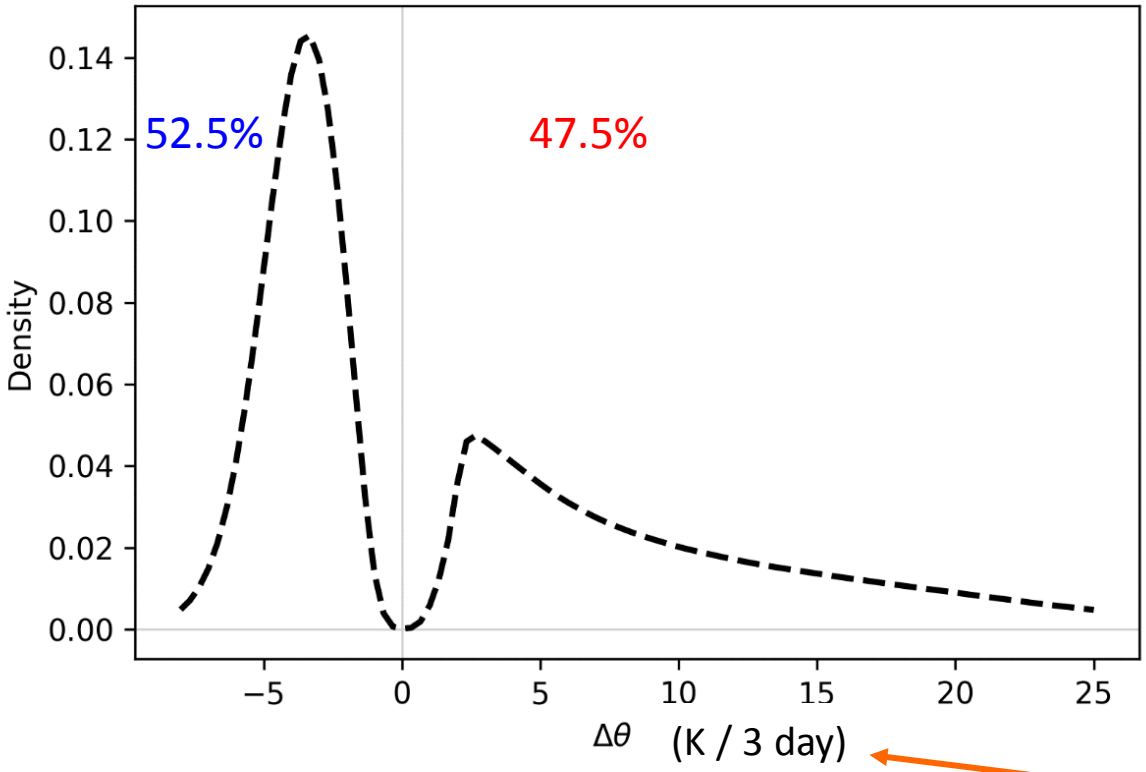


ETH zürich

Introduction | Motivation

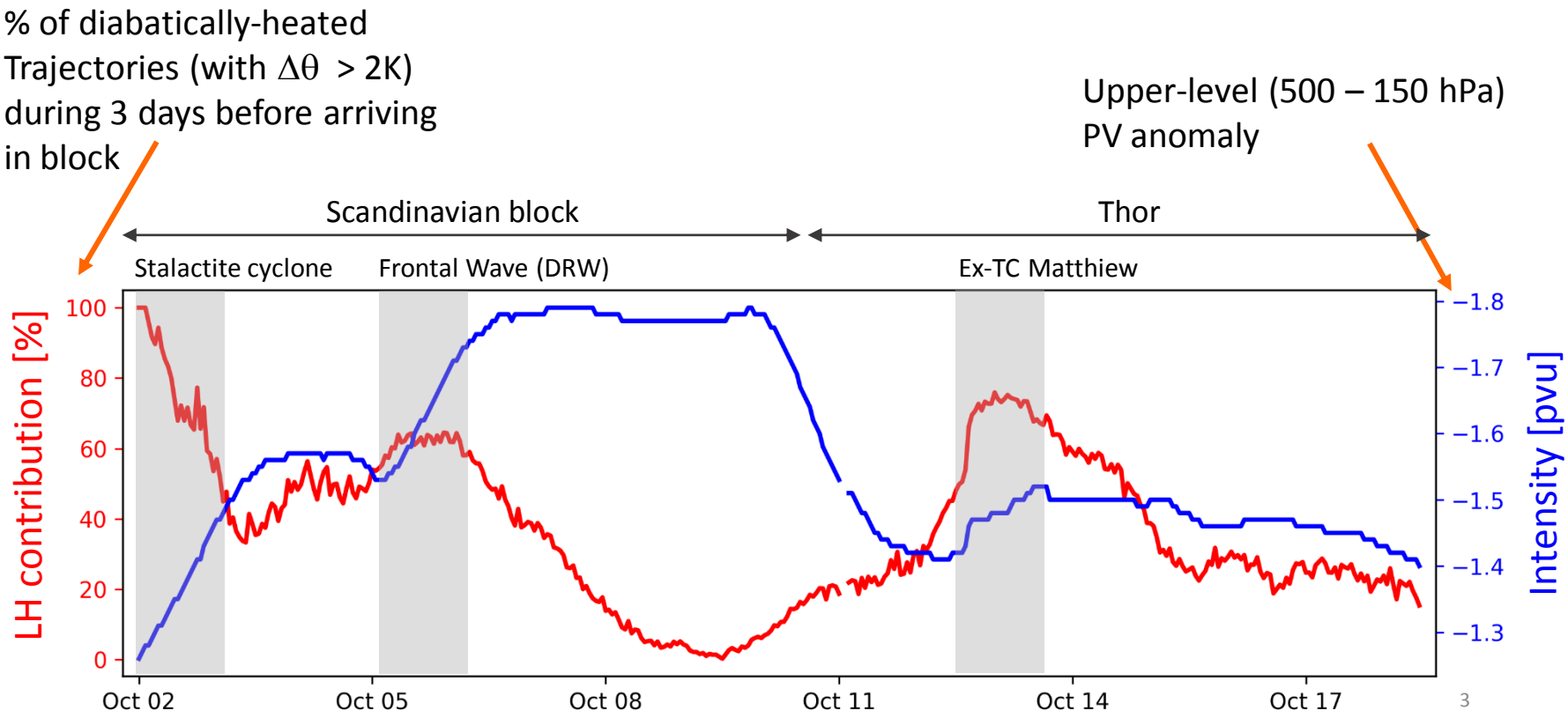
Air masses involved in blocking:
Era-Interim Climatology 1979 - 2016



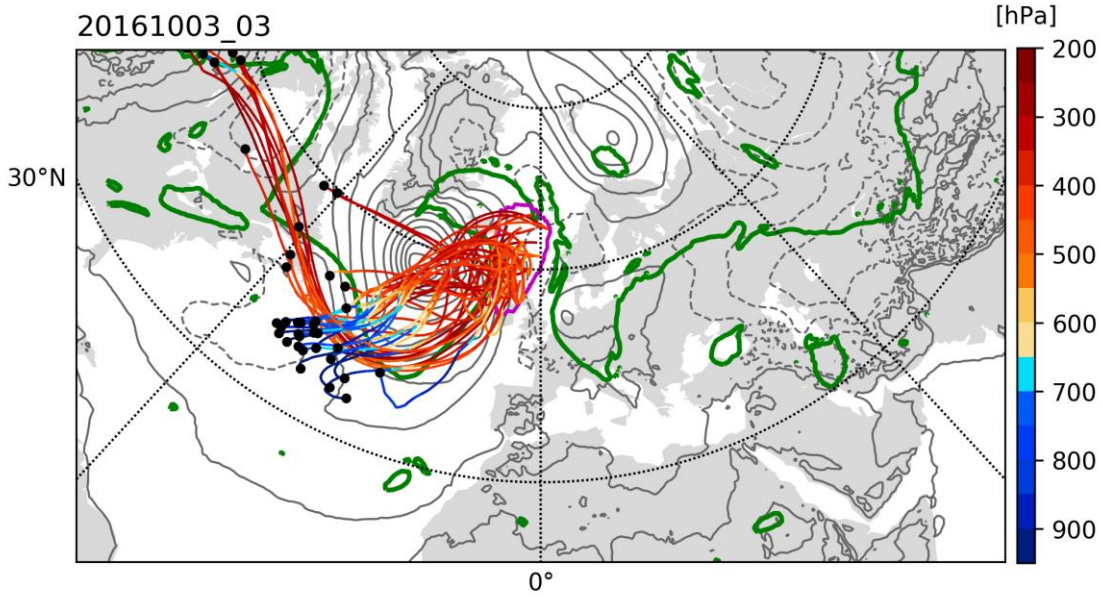
Diabatic heating/cooling during **3** days before arriving in block

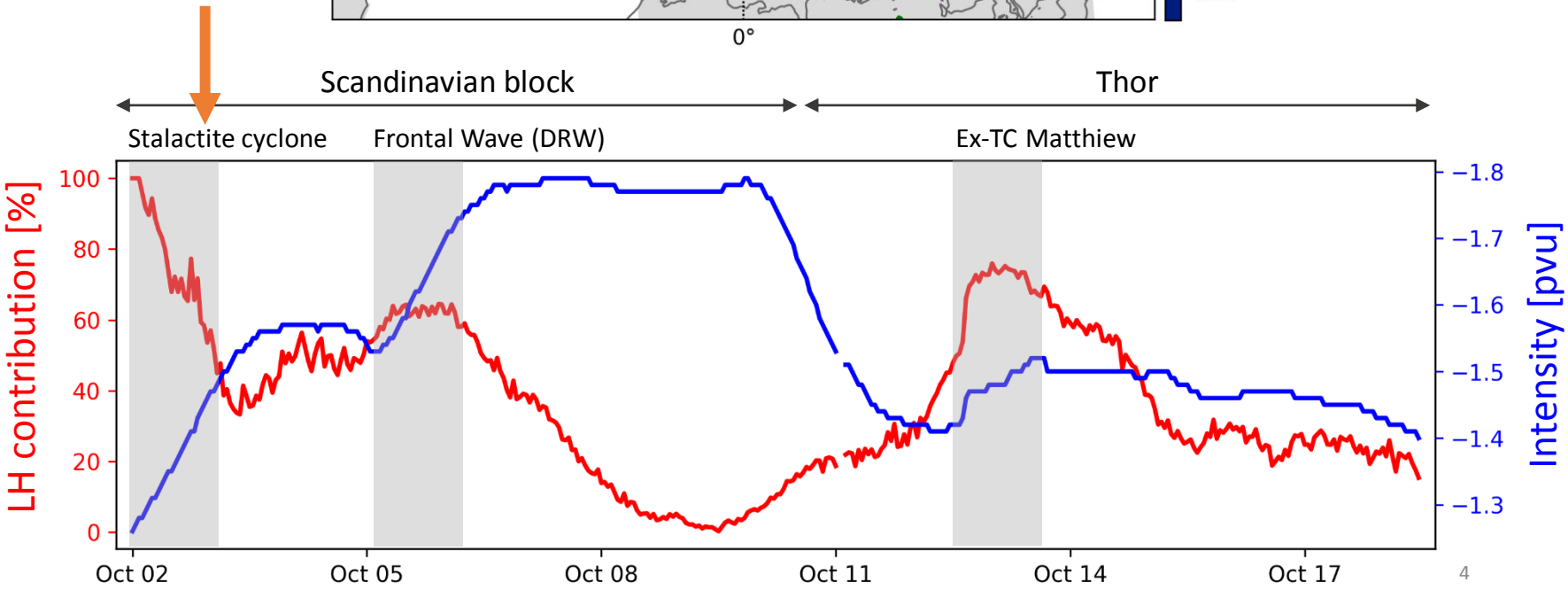
Steinfeld and Pfahl (Clim. Dyn., in revision)

Case overview| Block Thor

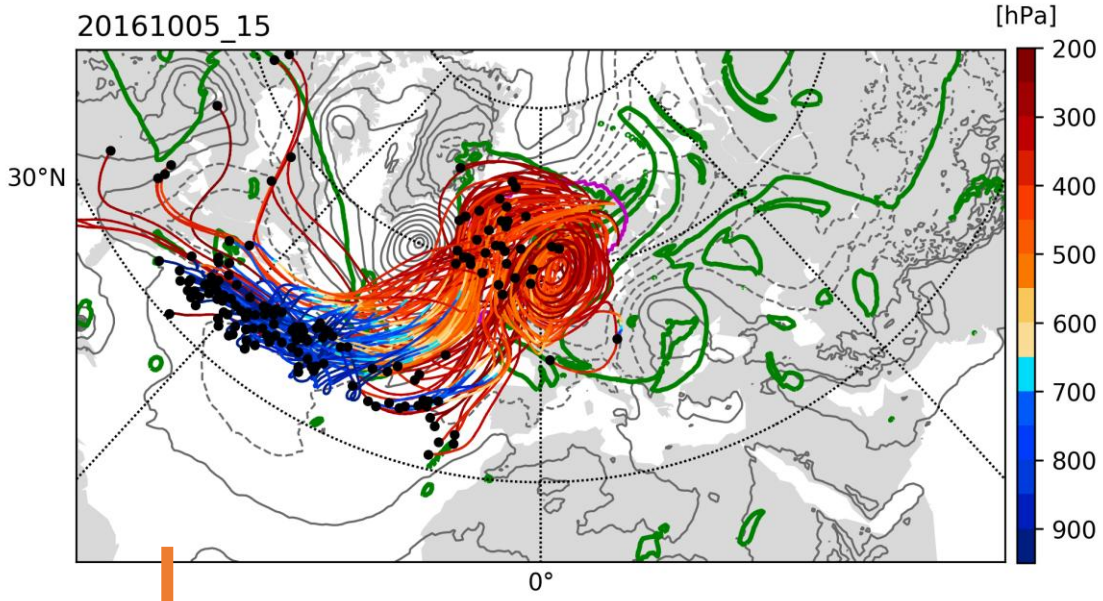


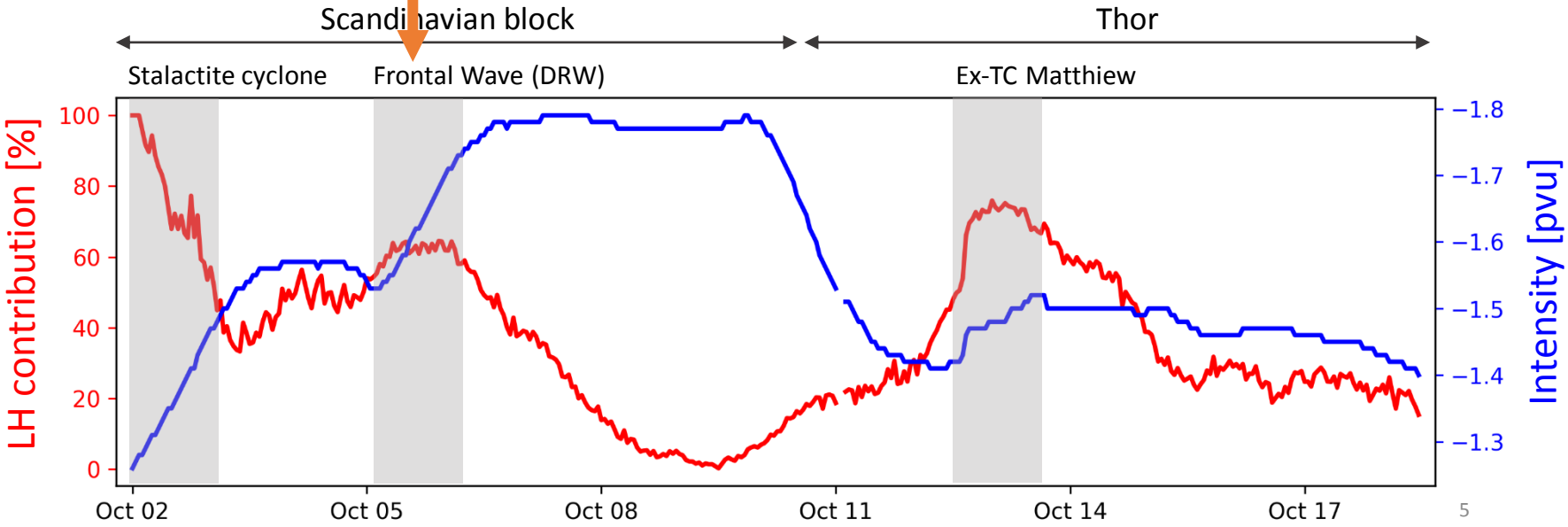
Case overview| Block Thor



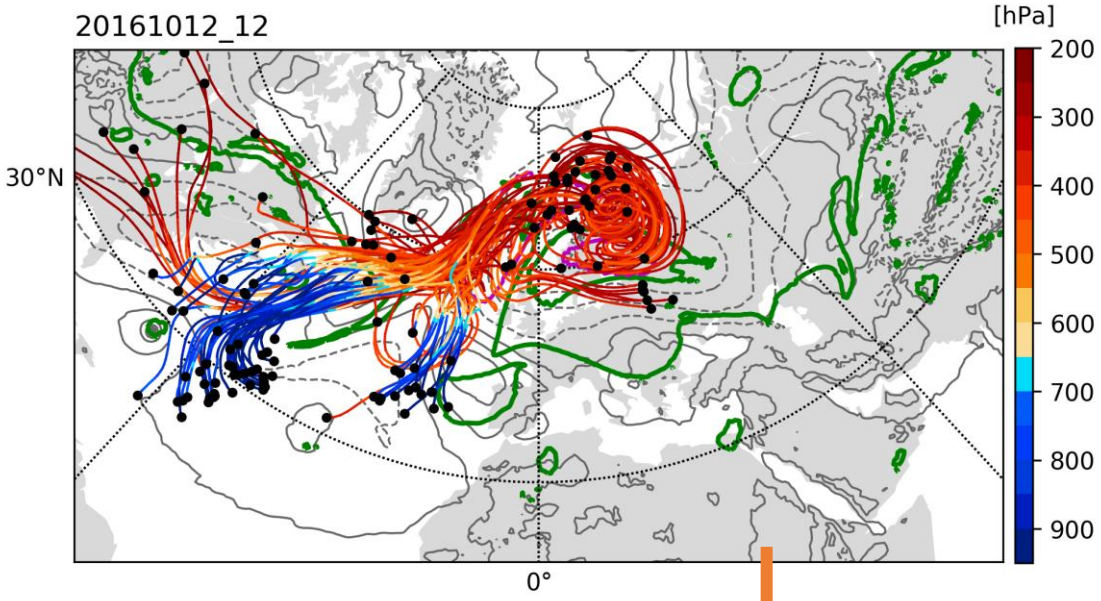


Case overview | Block Thor





Case overview| Block Thor



2 pvu @ 320 K

SLP

Block

Traj position at day -3

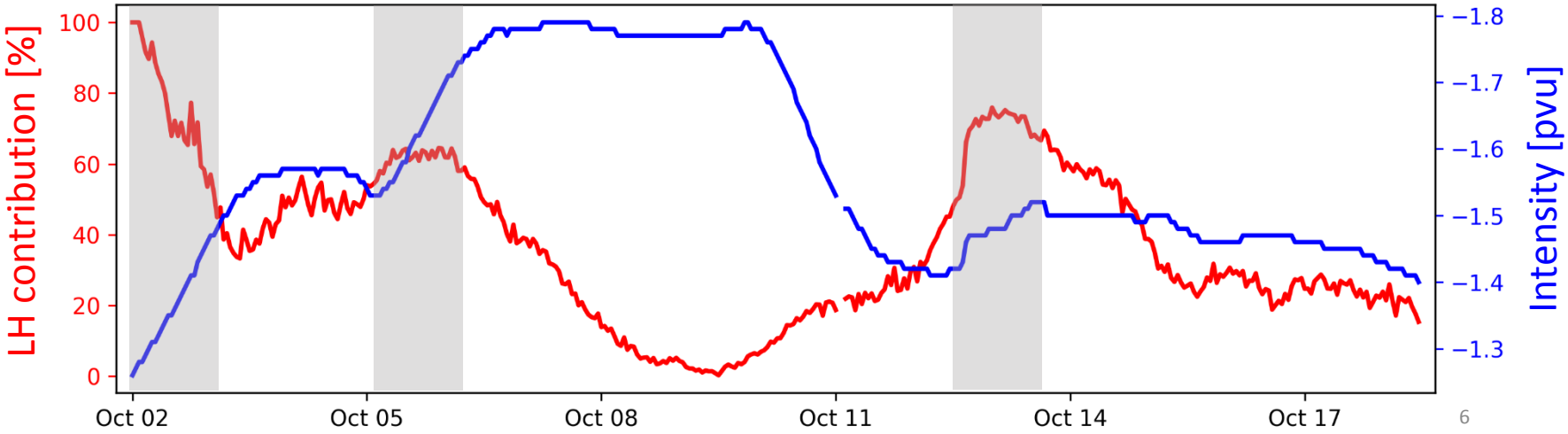
Scandinavian block

Thor

Stalactite cyclone

Frontal Wave (DRW)

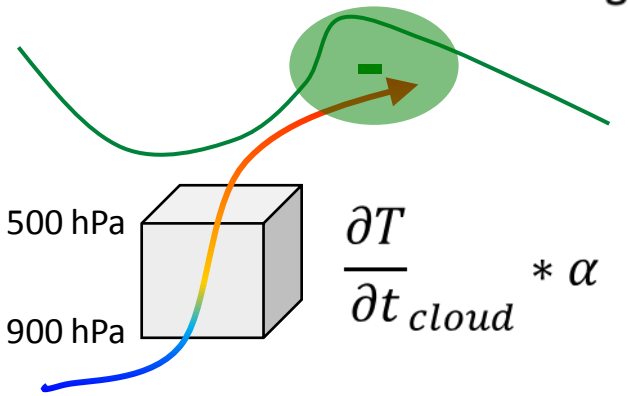
Ex-TC Matthiew



Sensitivity experiment | Method

- Model: ECMWF global NWP model Integrated Forecast System (IFS)

- Compare IFS 10-day forecasts
  - CNTRL (full physics) with $\alpha = 1$
  - Sensitivity runs with modified LH in the WCB region with $\alpha = 0.0, 0.5$ and 1.5



- Two experiments:
  - Onset phase: 30 Sept – 10 Oct
  - Maintenance phase: 10 Oct – 20 Oct

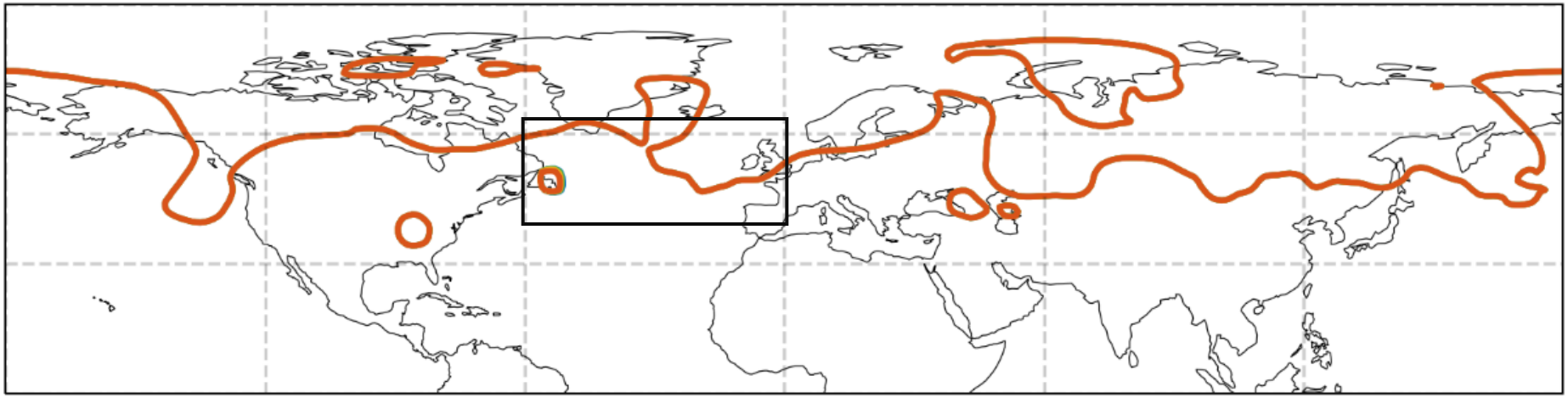
- Note: all fields are vertically averaged between 500 – 150 hPa

Onset phase| Results

2 pvu contours

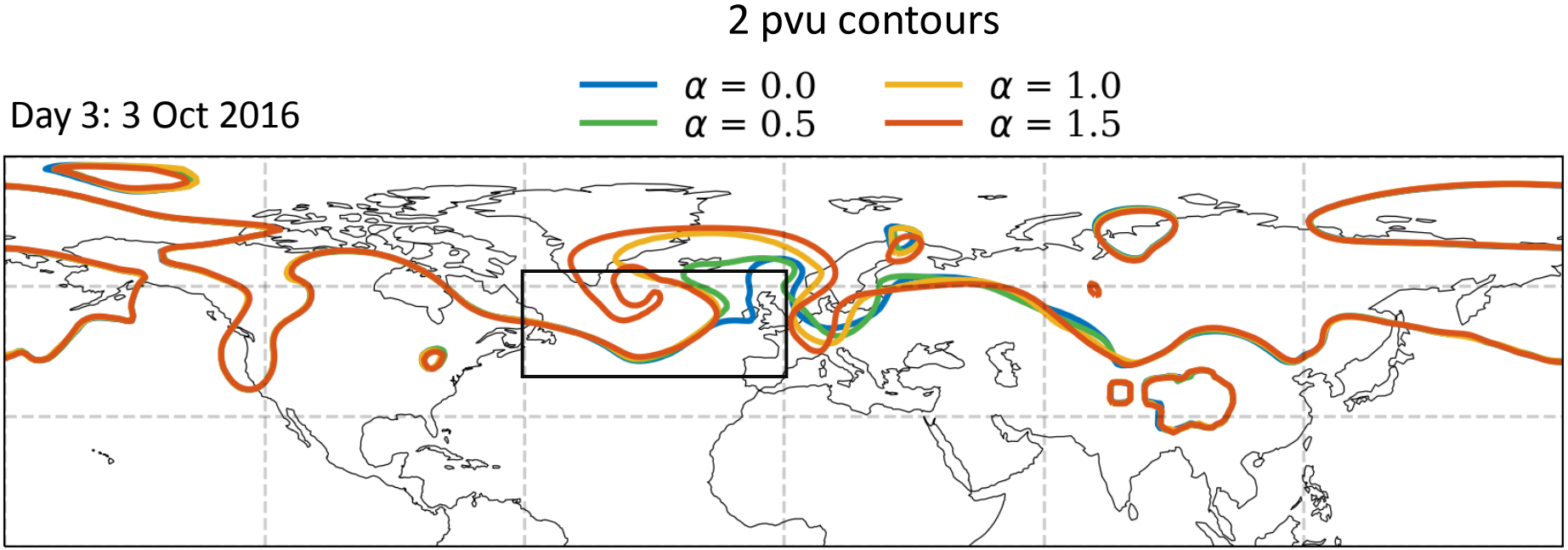
$\alpha = 0.0$ $\alpha = 1.0$
$\alpha = 0.5$ $\alpha = 1.5$

Day 0: 30 Sep 2016



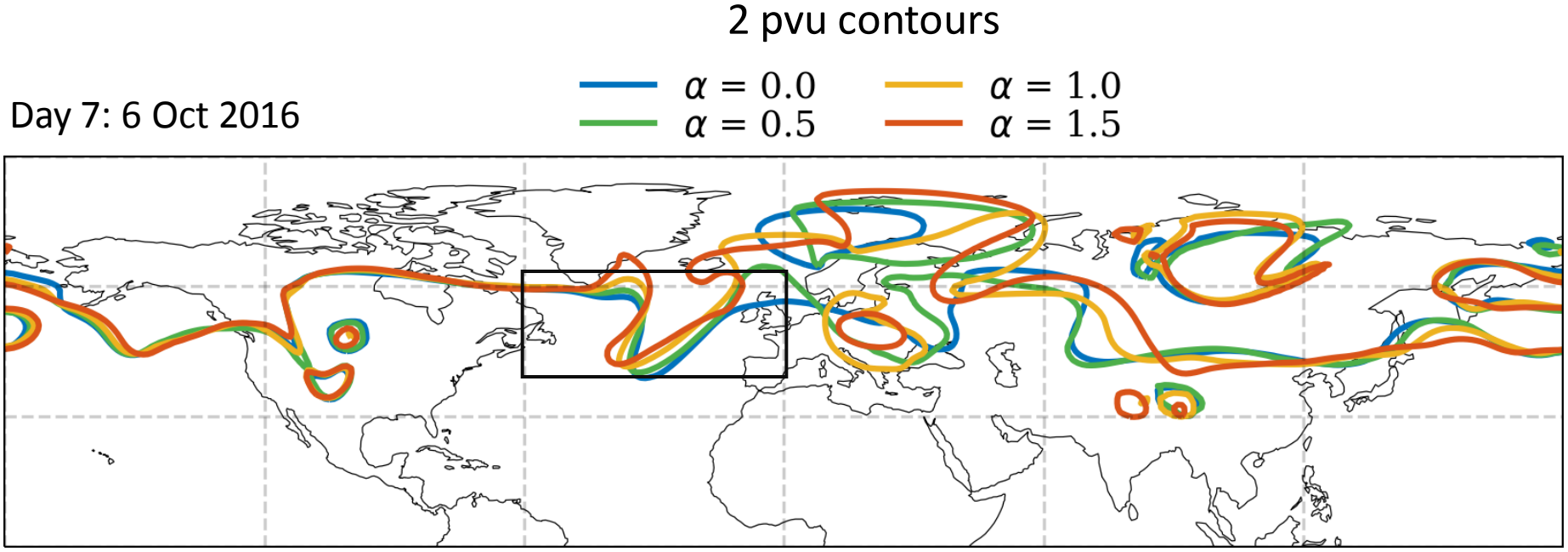
Onset phase| Results

Day 3: 3 Oct 2016



Onset phase| Results

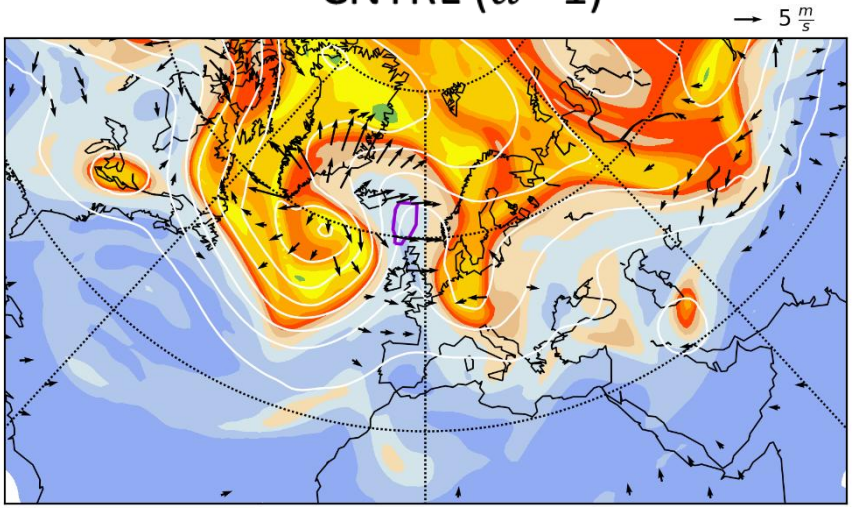
Day 7: 6 Oct 2016



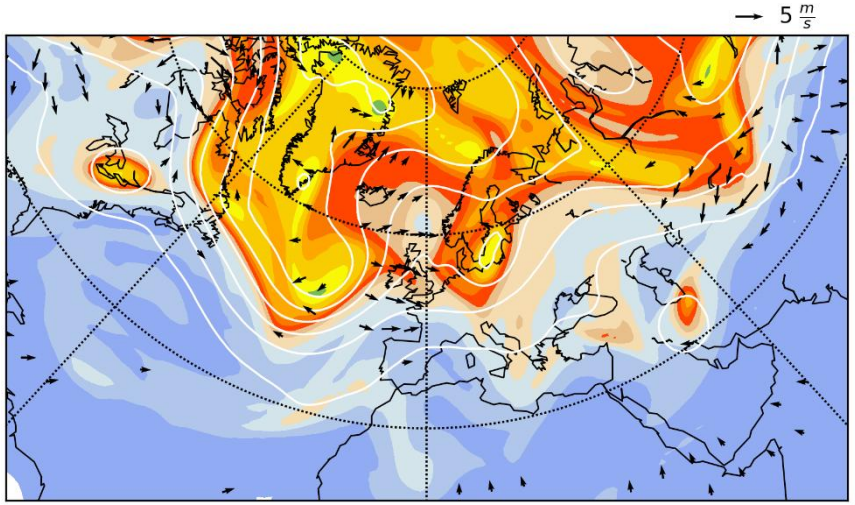
Onset phase| day 3

3 Oct 2016

CNTRL (α= 1)



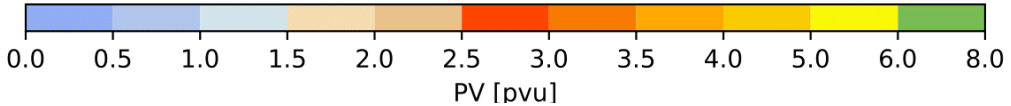
NOLH (α= 0)

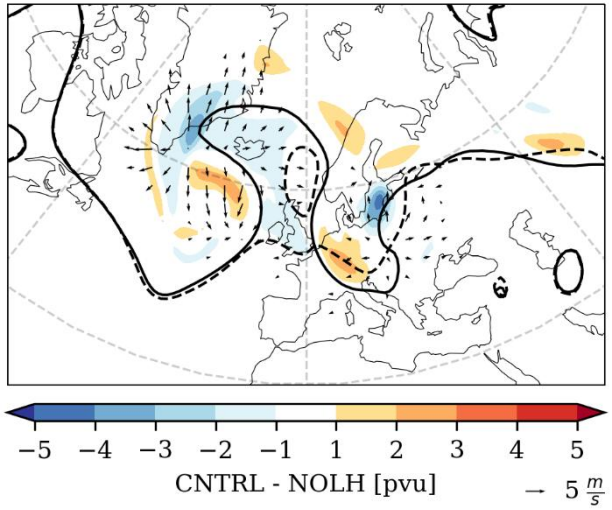


Z500

Block

divergent wind



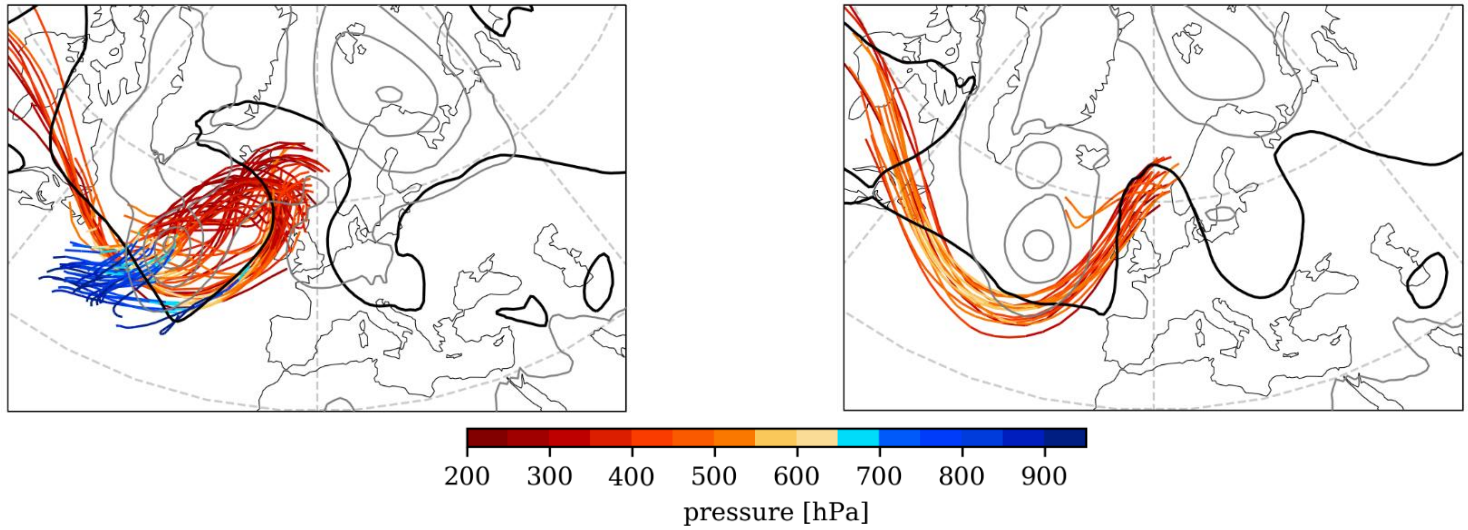


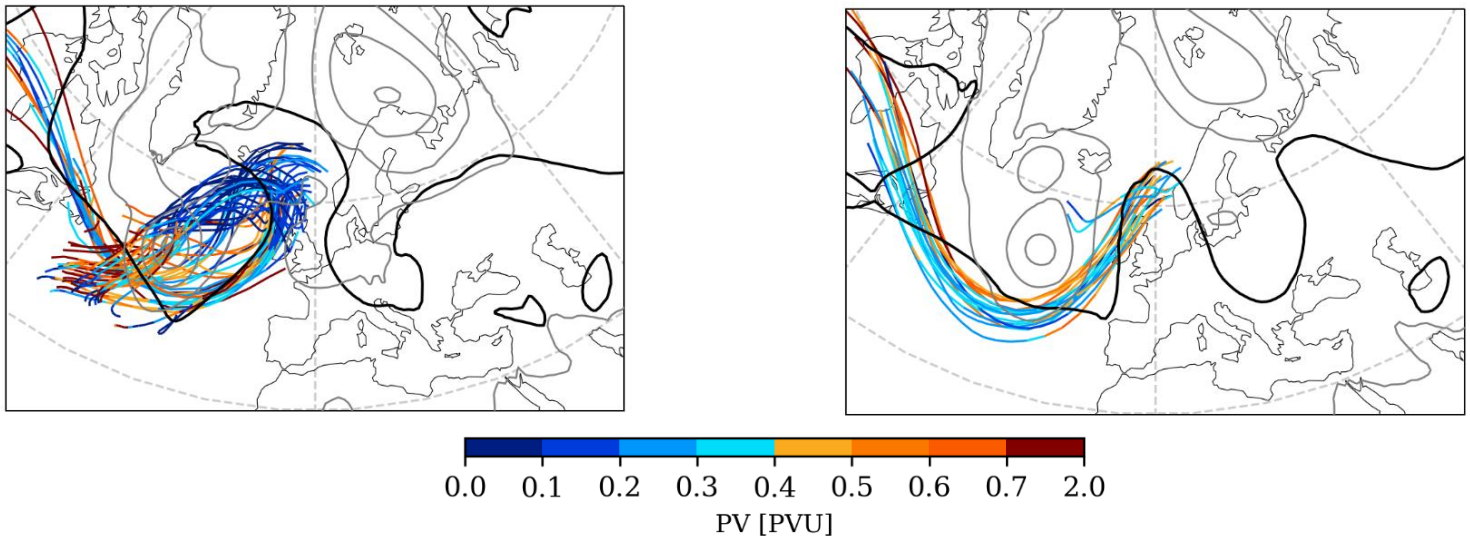
Onset phase| Direct effect of LH

4 Oct 2016

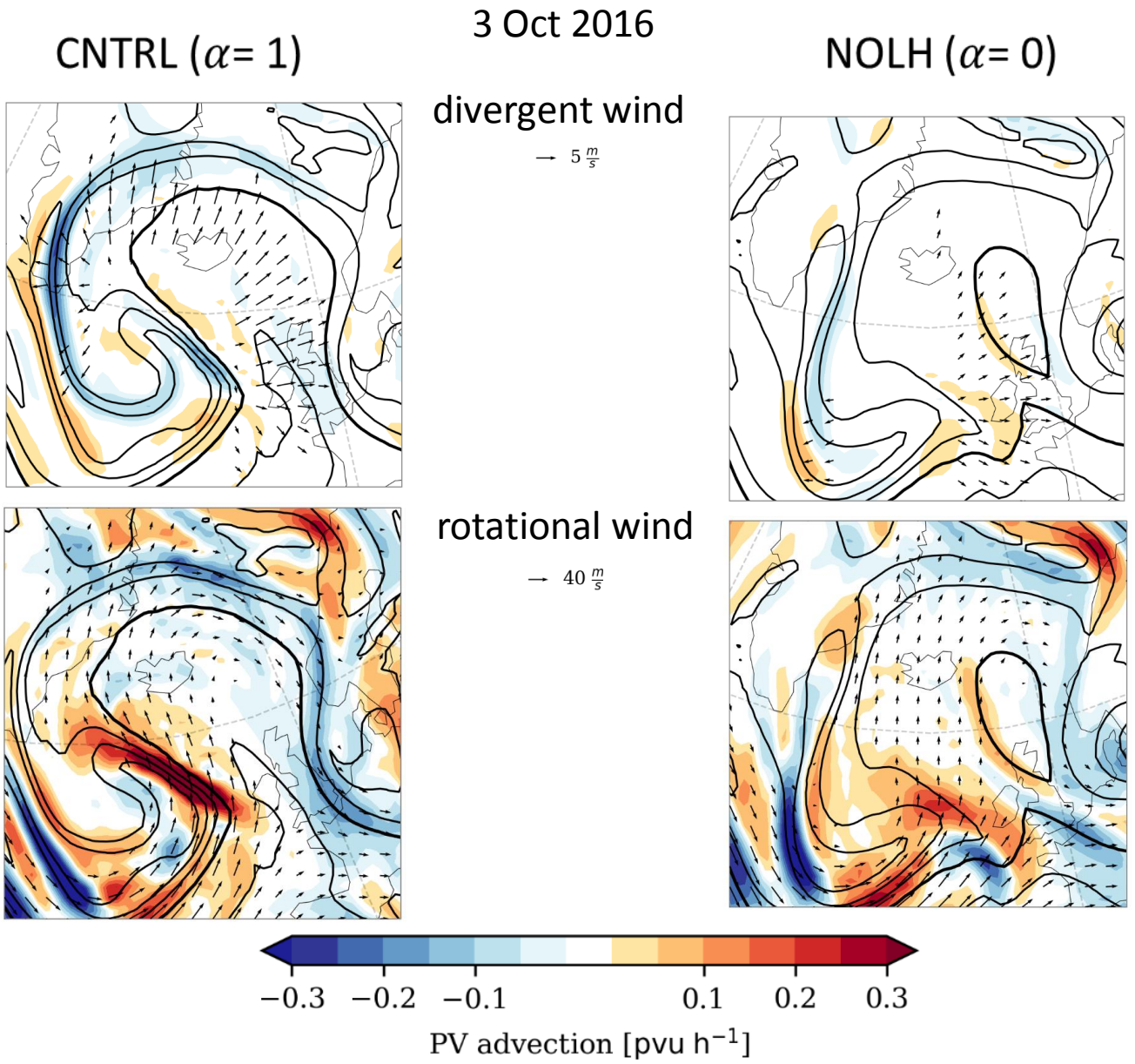
CNTRL (α= 1)

NOLH (α= 0)

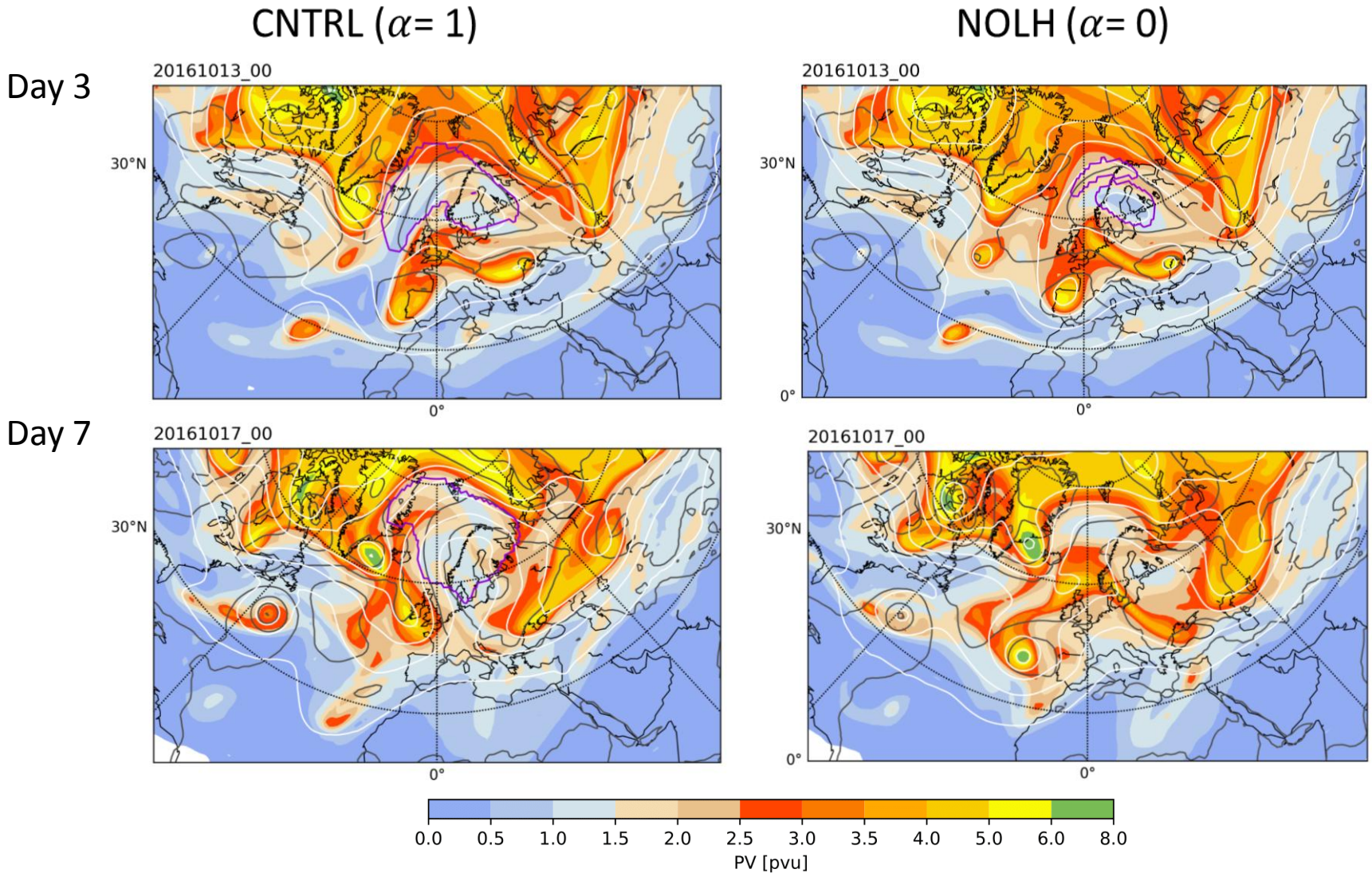




Onset phase| Indirect effect of LH



Maintenance phase| Results



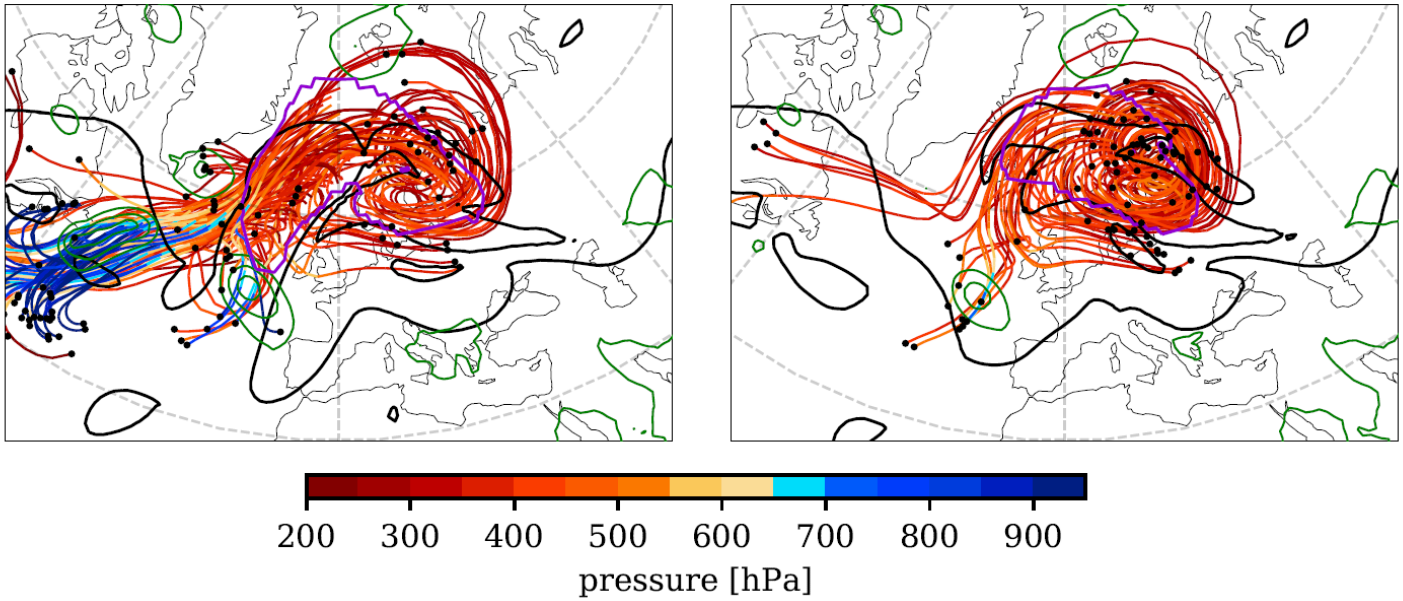
Maintenance phase| Results

13 Oct 2016

CNTRL (α= 1)

NOLH (α= 0)

Day 3



Conclusion| Synthesis

Climatology

Around 50% of all blocking air masses ascend diabatically into the blocking region

Blocking mechanism

Blocking life cycle is characterized by multiple impulses of LH associated with upstream cyclones

Sensitivity study

changes in the latent heat release lead to distinct differences in the blocking life cycle

Thank you!