SPE & OZONE/NO

A STUDY BASED ON DENTON ET AL. USING MLS AND SOFIE

Jia Jia, Antti Kero

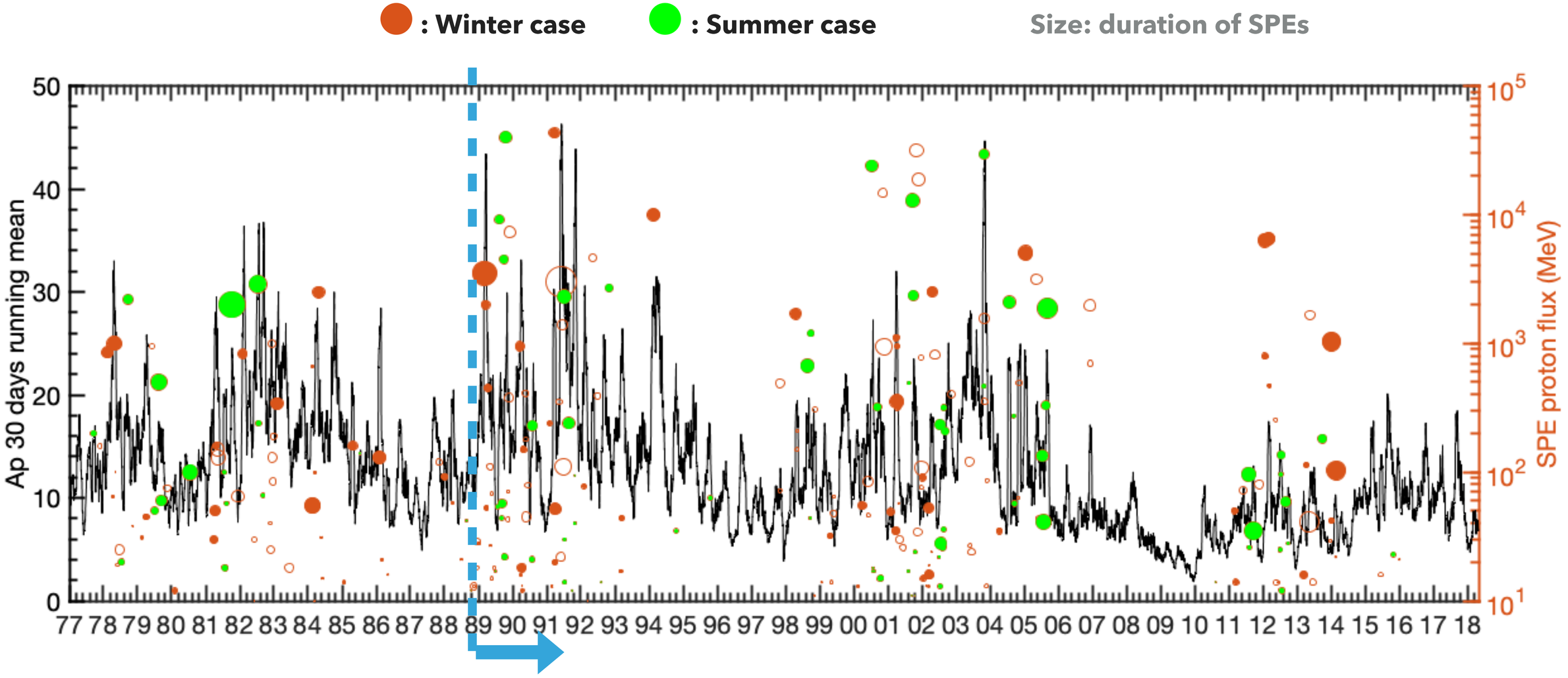
SGO, Uni. Oulu

ISSI Bern, Switzerland 2020.02.03

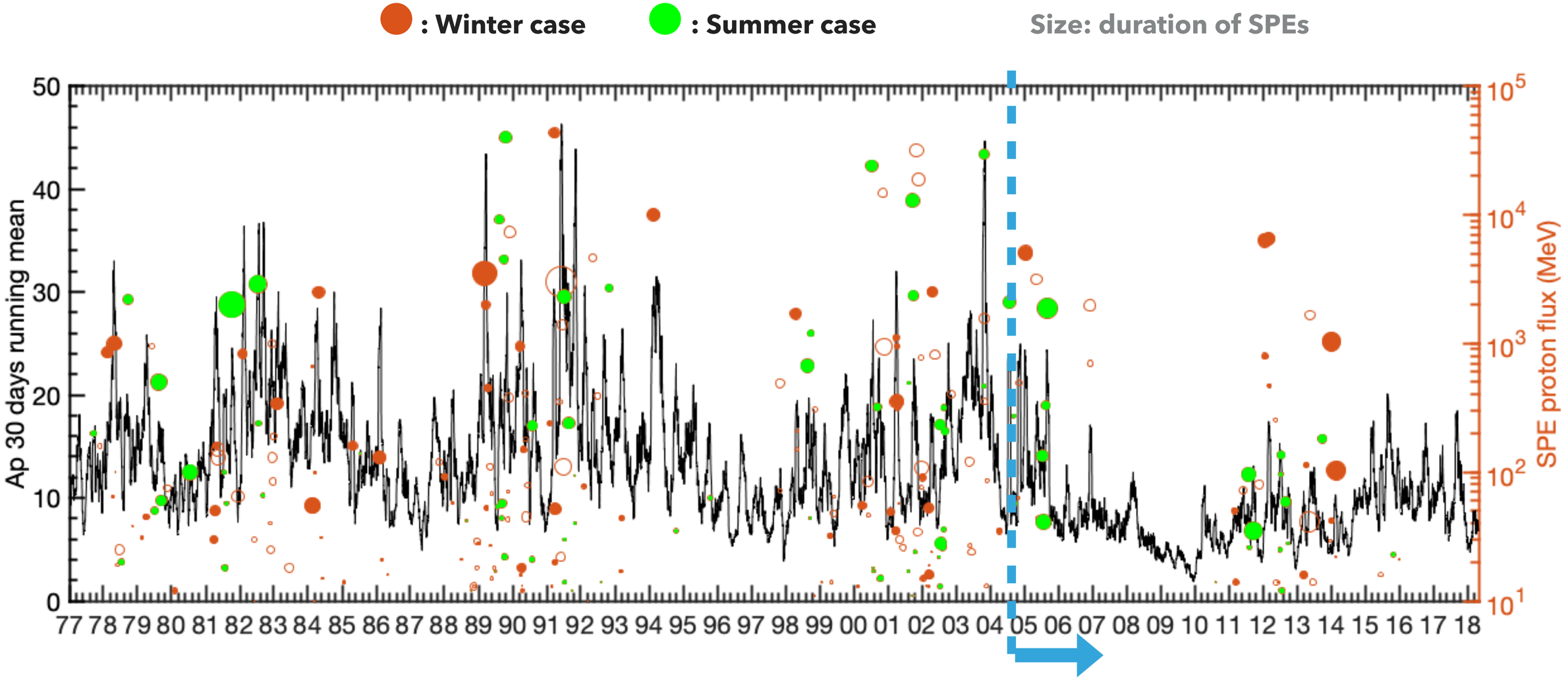
jia.jia@sgo.fi

LIST OF SPE

SPE event list: https://www.ngdc.noaa.gov/stp/satellite/goes/index.html



NUMBER OF SPE DURING MLS OPERATIONAL TIME



NUMBER OF SPE DURING MLS OPERATIONAL TIME

	1, No restriction	2, Energy>50 pfu	3, No overlap in 10 days	4, Energy>50 pff & no overlap in 10 days
All Events	**47**	26	35	17
Jan-Apr Events	13	7	9	4
Jul-Oct Events	18	10	13	7

METHOD

Ozone change: Direct changes in VMR

(Observation - Daily Climatology)

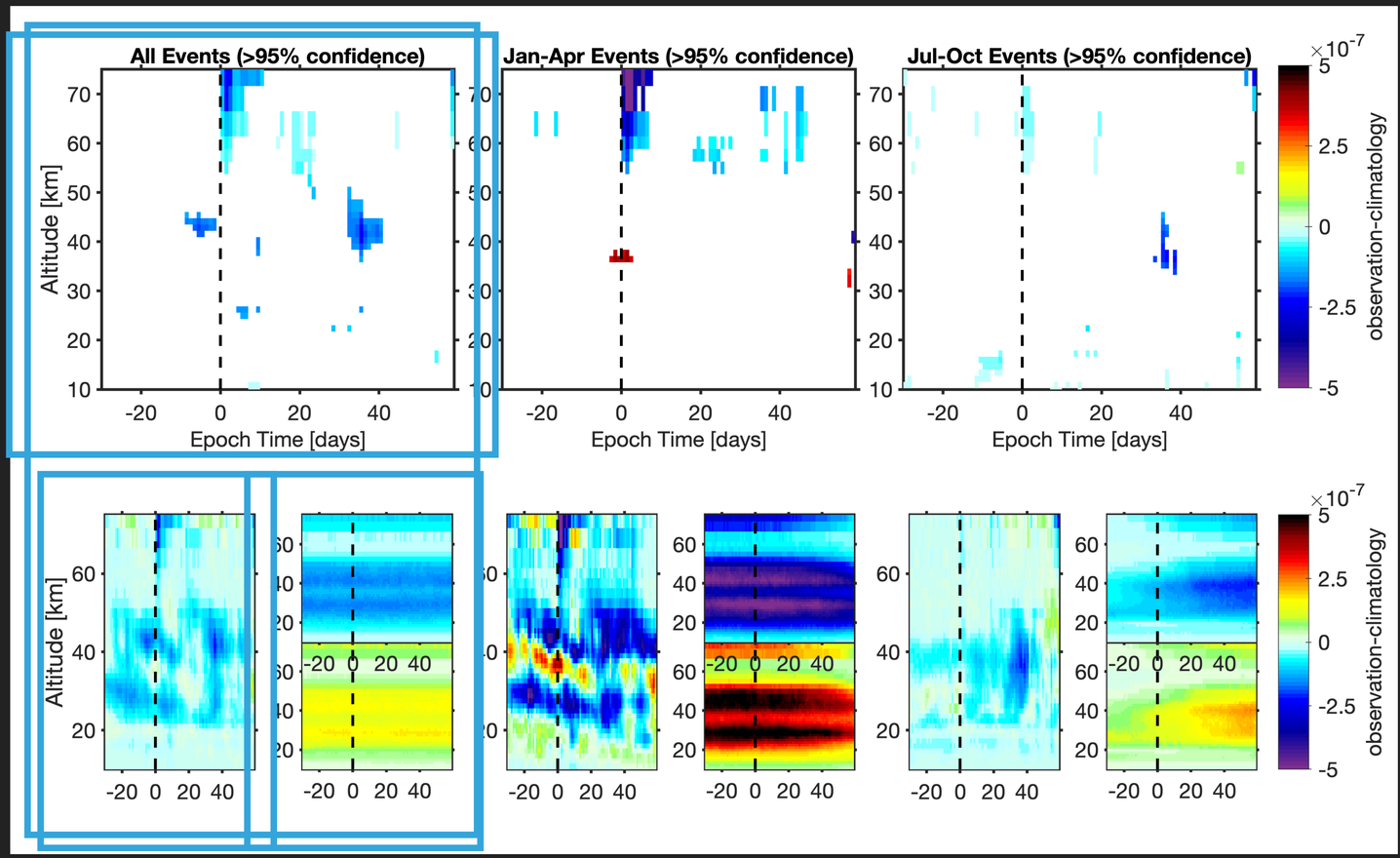
Superposed Epoch Analysis of the set of the SPE events:

30 days before- 60 days after

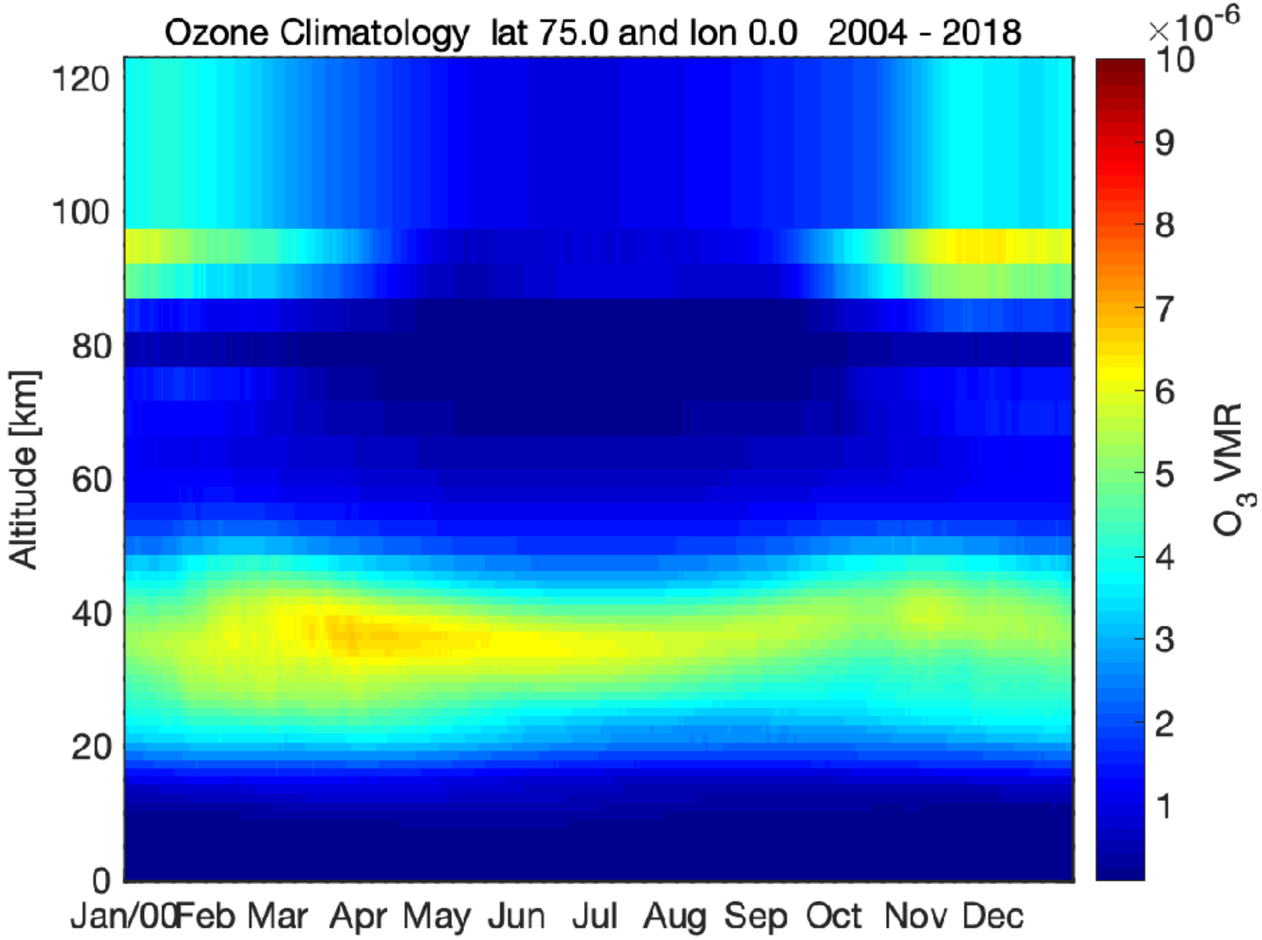
Reference: Superposed Epoch Analysis from 2000 random **set**s of the events

RESULT EXAMPLE

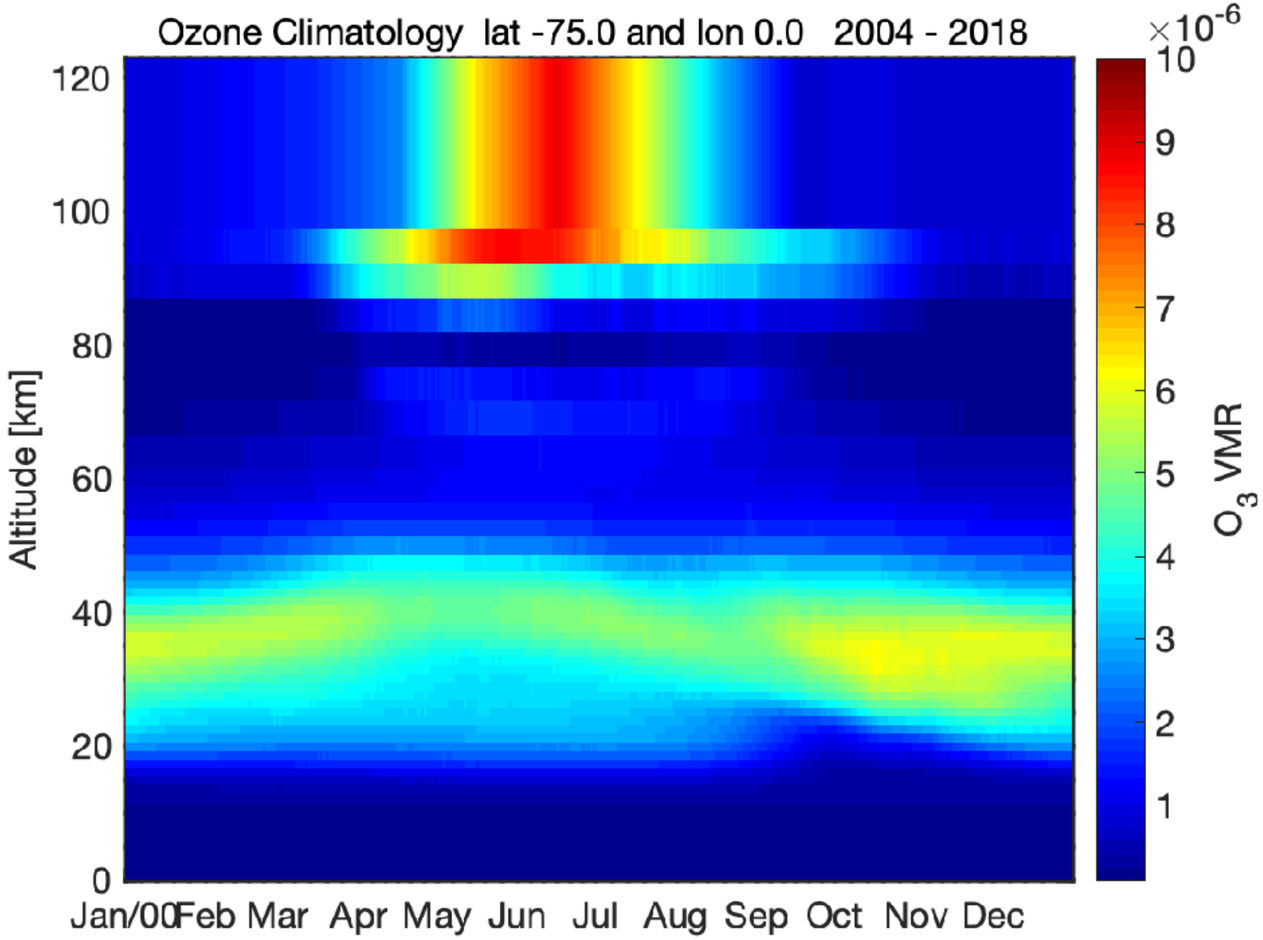
ALL WINTER SUMMER



ARCTIC POLAR CAP

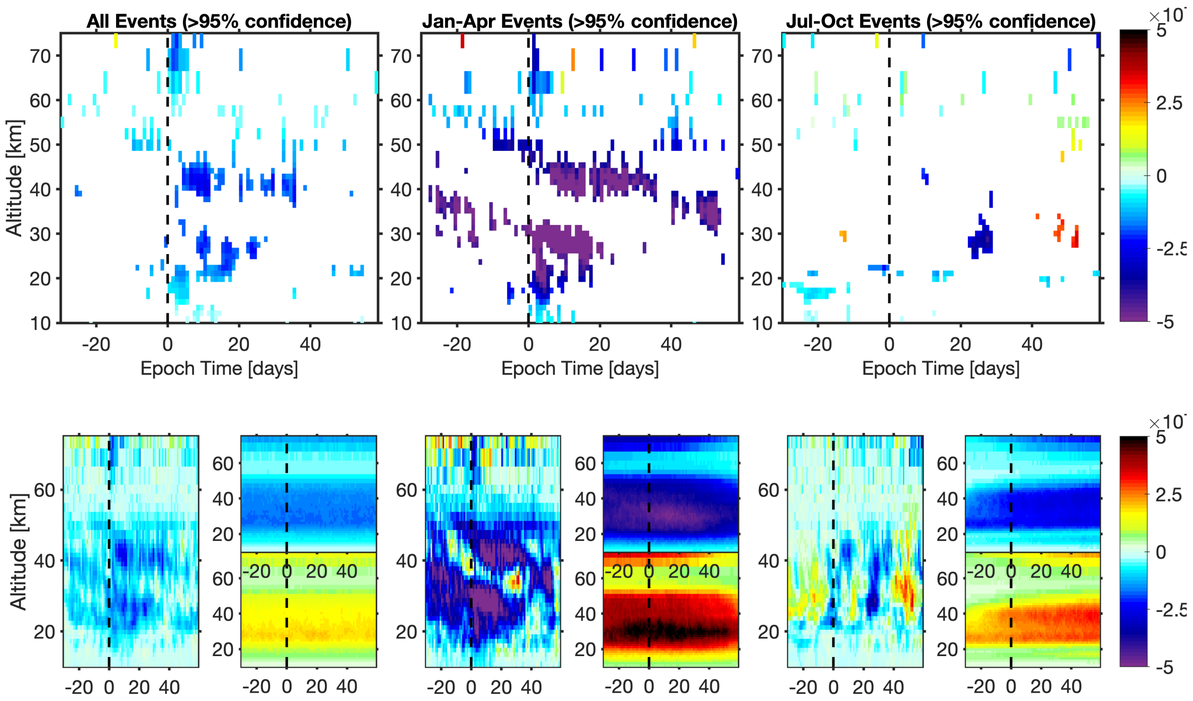


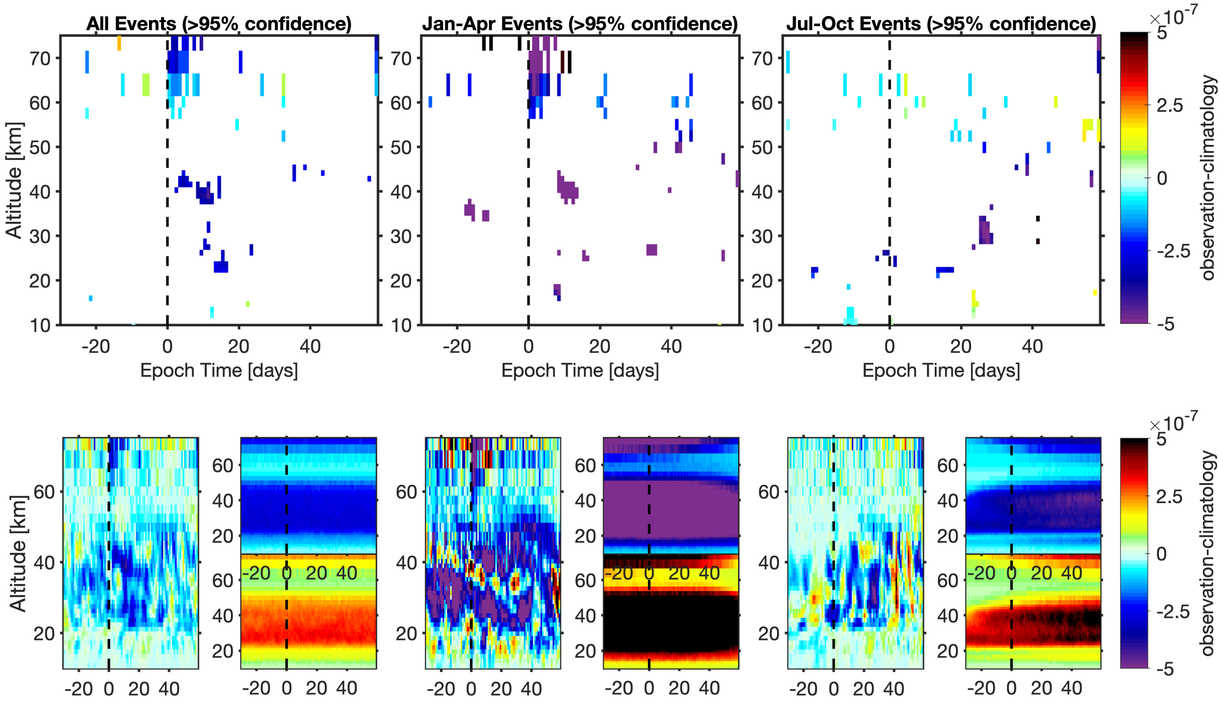
ANTARCTIC POLAR CAP



Ny-Ålesund:

78.9°N +- 2.5°; 12.1°E +- 15°





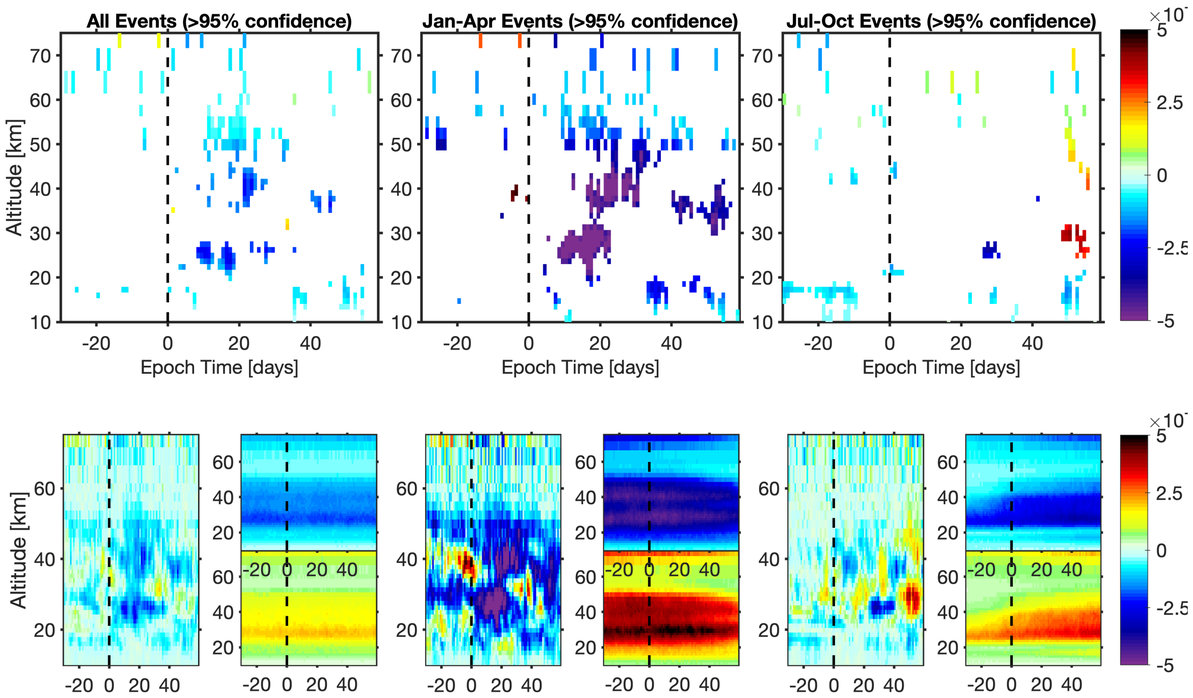
SPE NO. 47 13 18 17 4 7

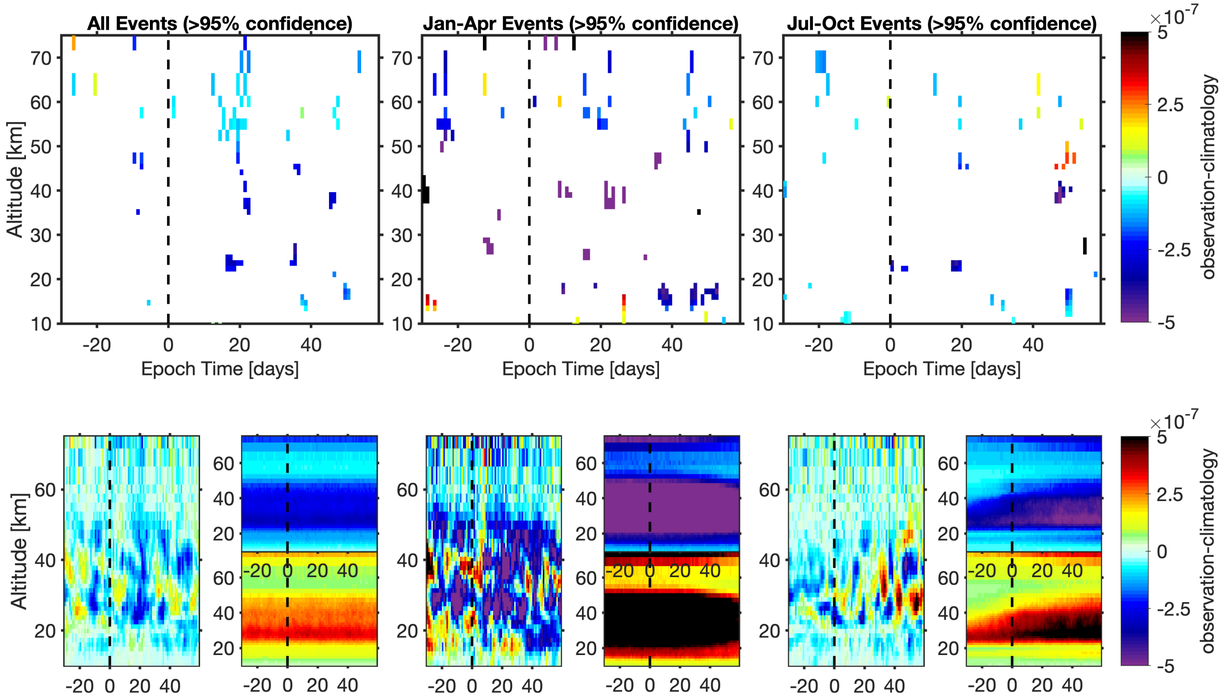
No restriction

Energy>50pfu & no overlap in 10 days

Sodankylä:

67.3°N +- 2.5°; 26.6°E +- 15°





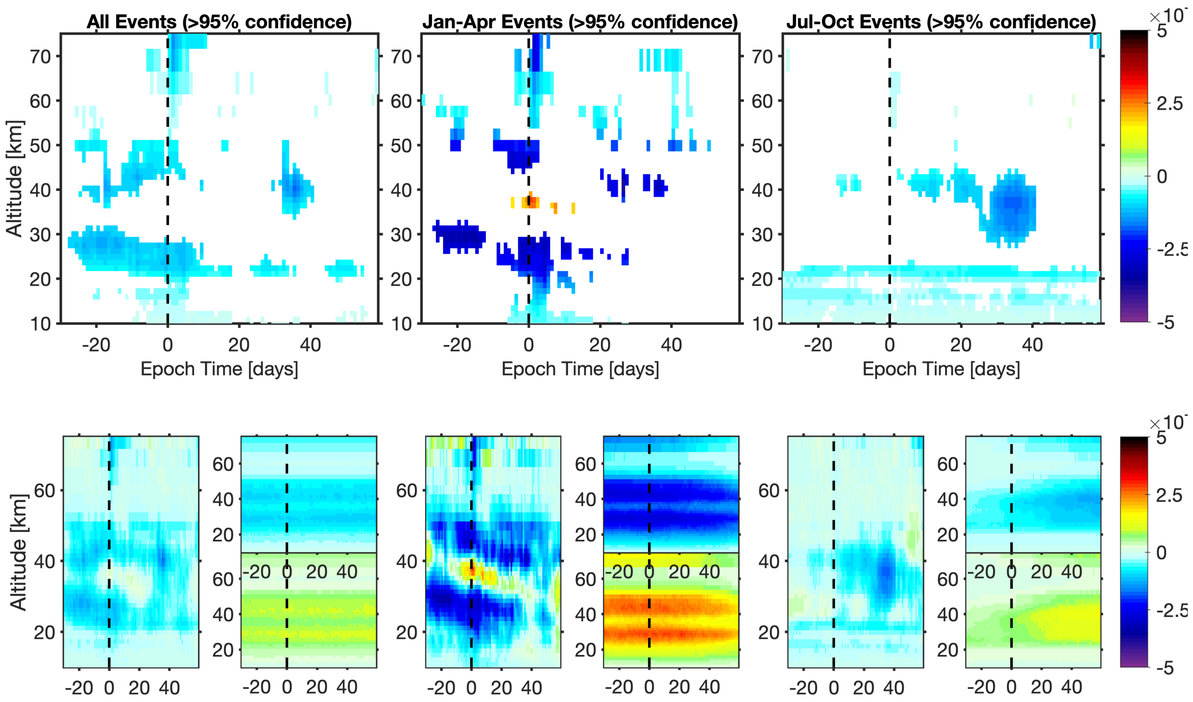
SPE NO. 47 13 18 17 4 7

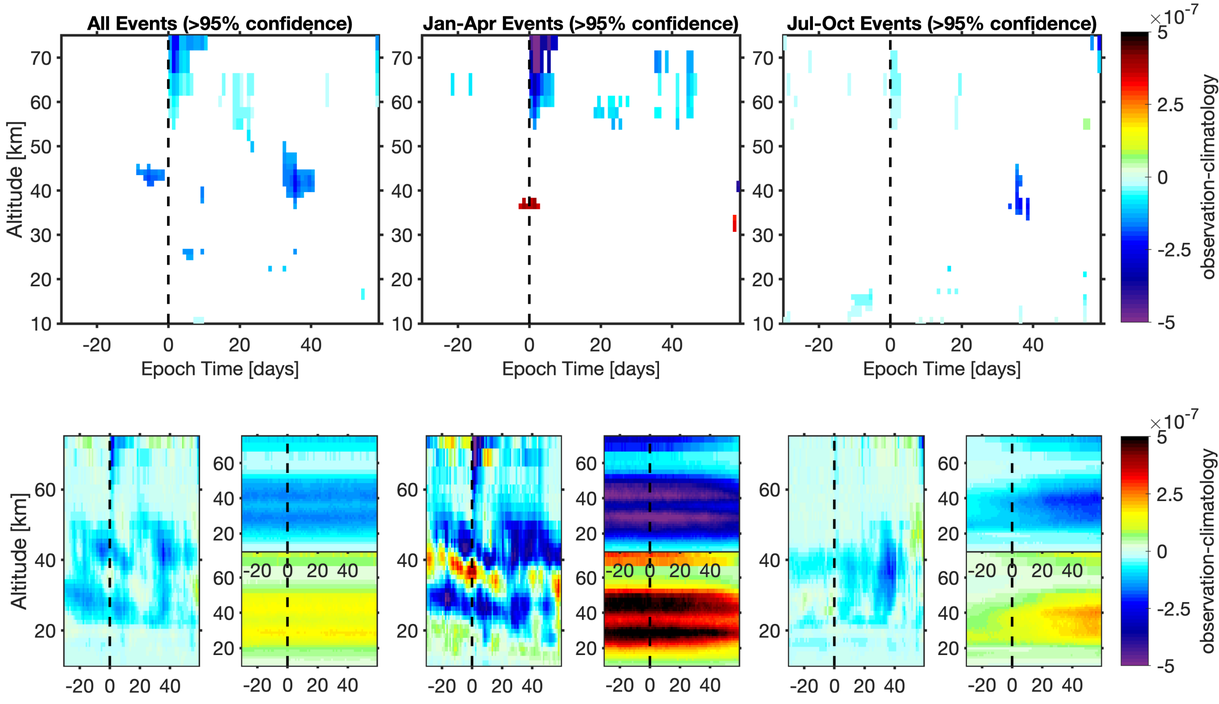
No restriction

Energy>50pfu & no overlap in 10 days

Arctic Polar Cap:

60°N – 90°N



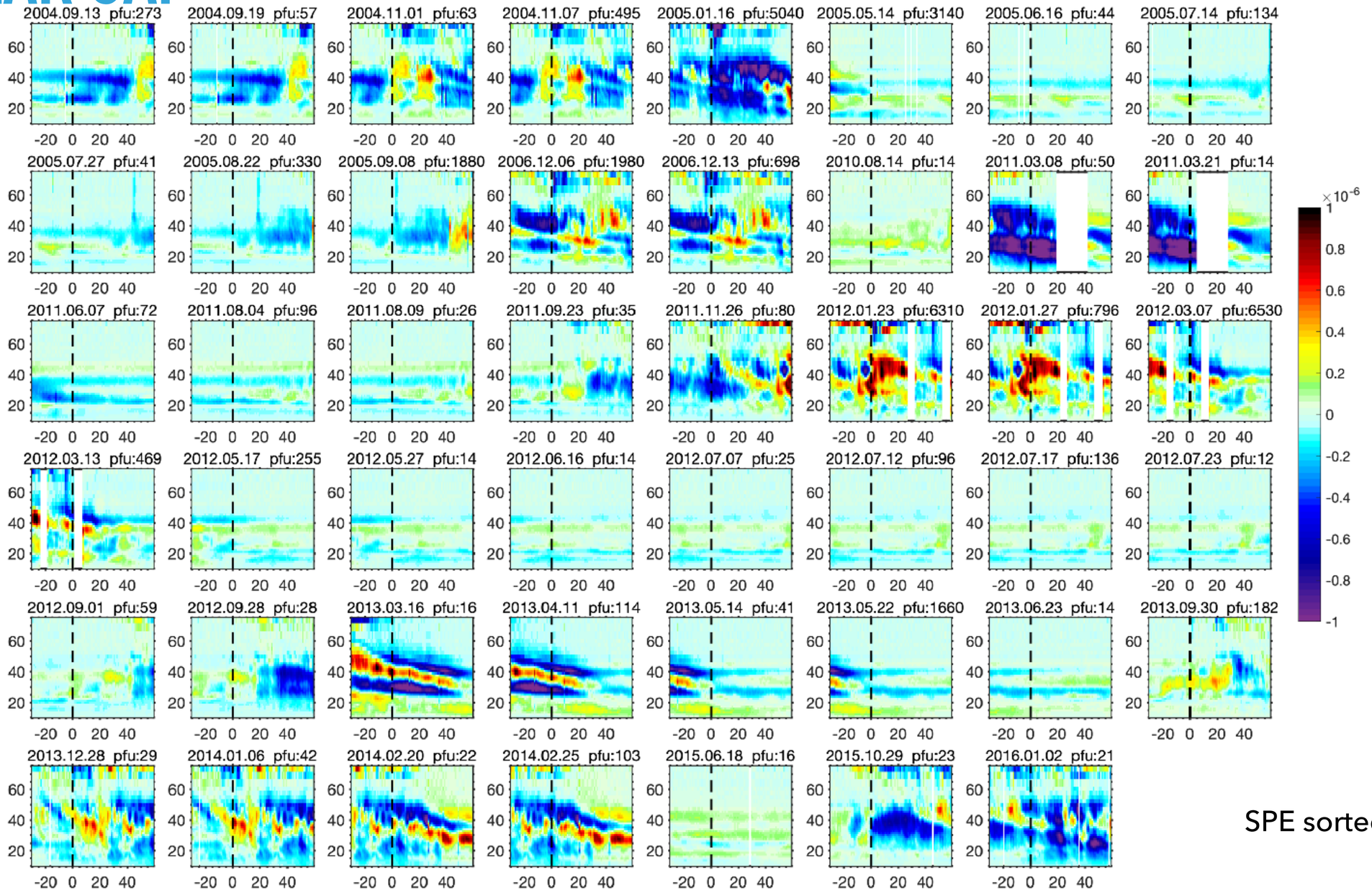


SPE NO.	47	13	18	17	4	7

No restriction

Energy>50pfu & no overlap in 10 days

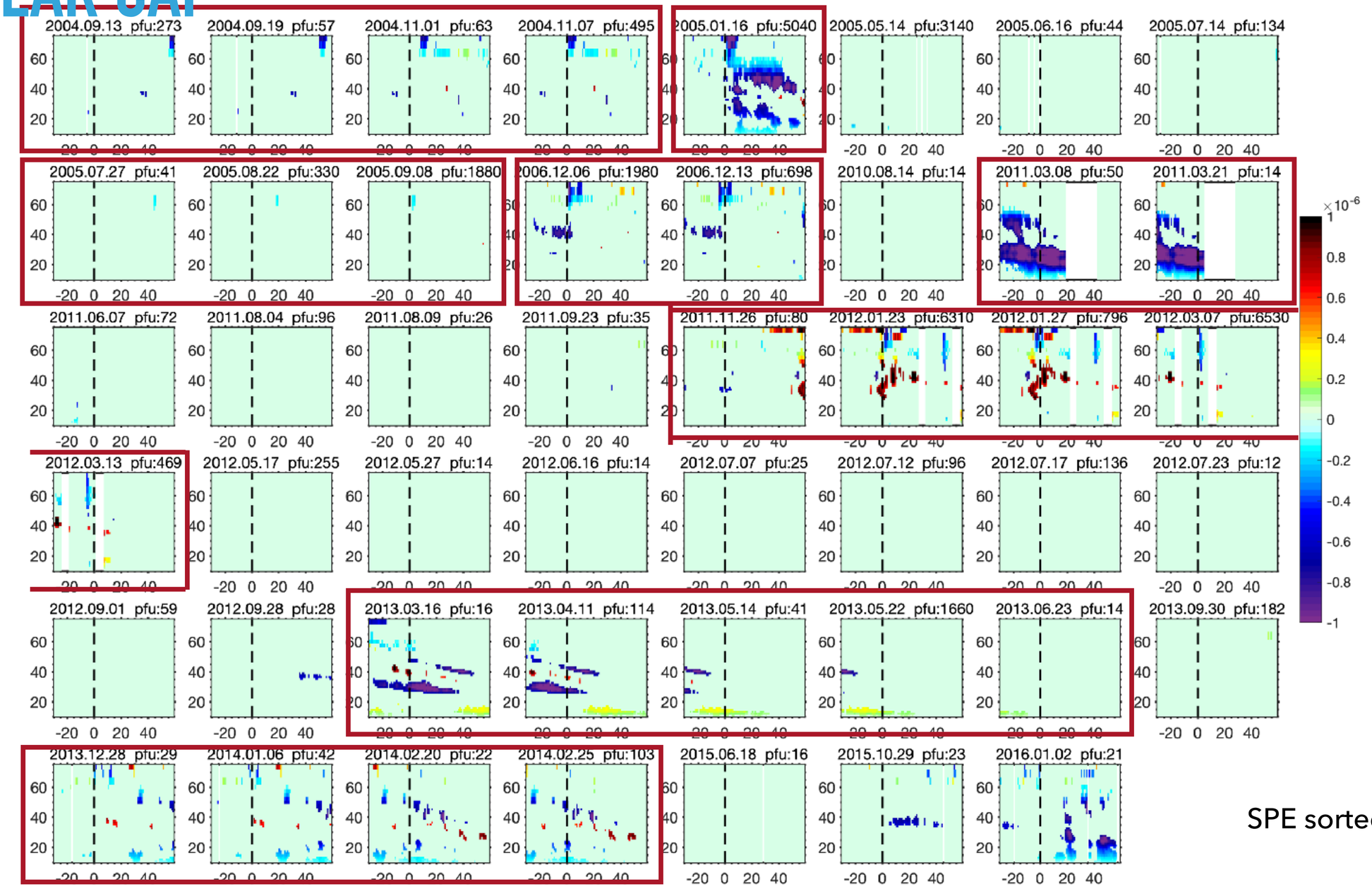
ARCTIC POLAR CAP



SPE sorted by date

Daily MLS O3 observation (VMR)-Daily climatology

ARCTIC POLAR CAP

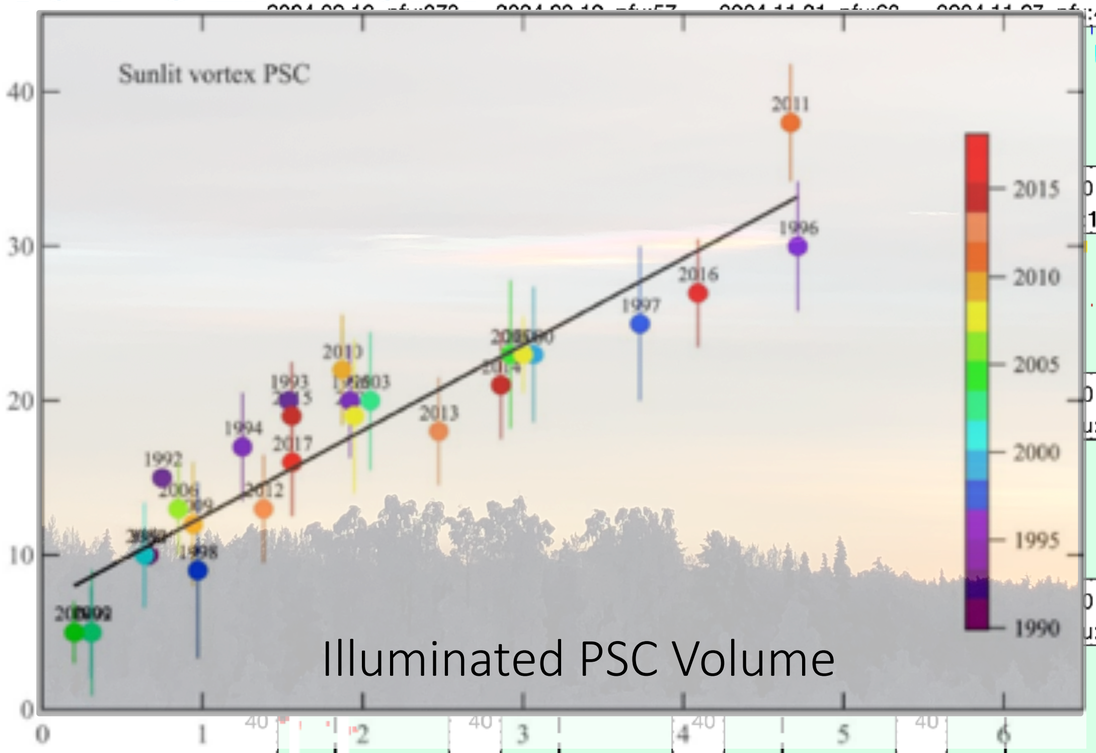


SPE sorted by date

95% confidence

Daily MLS O3 observation (VMR)-Daily climatology

ARCTIC POLAR CAP



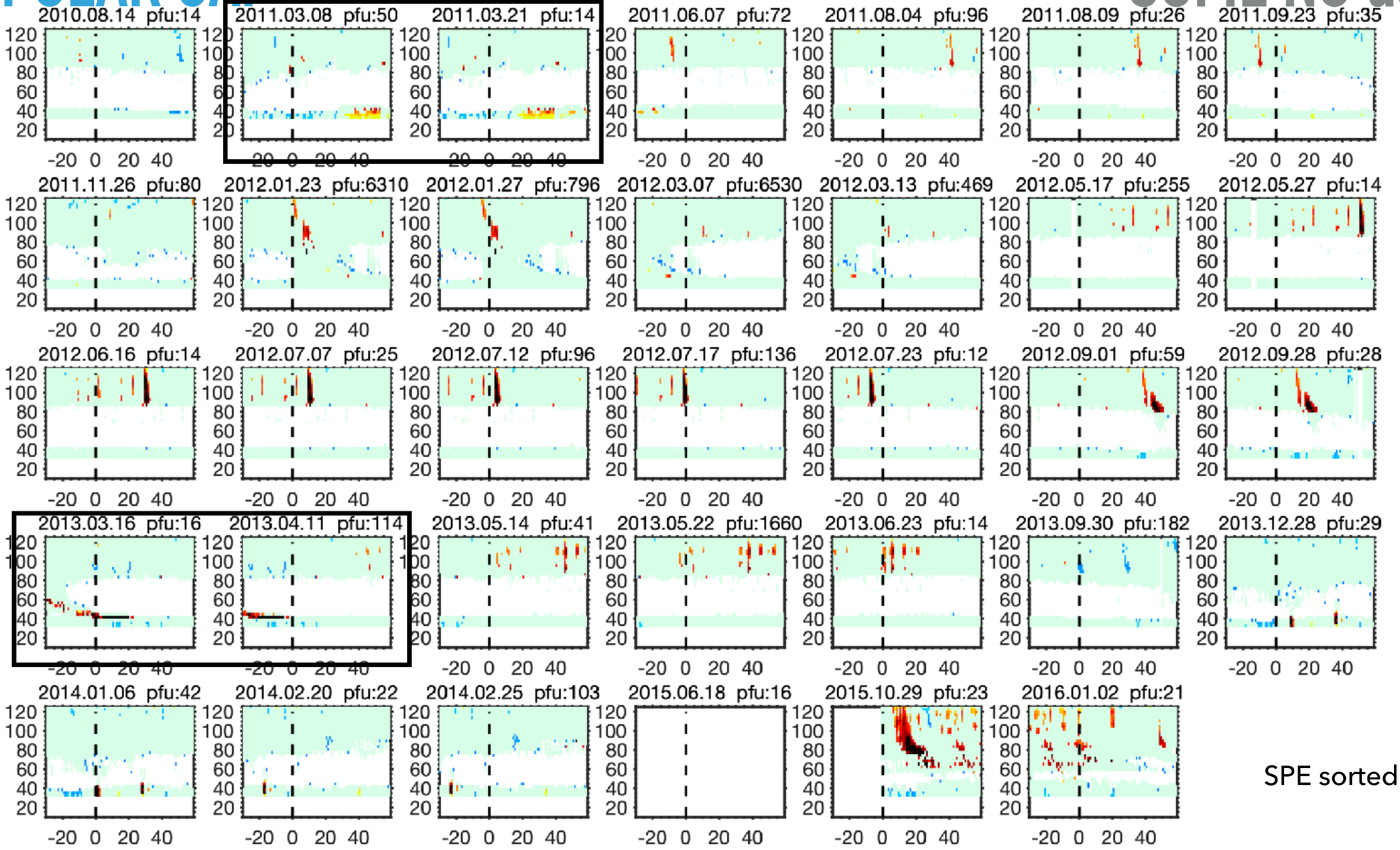
SPE sorted by date

95% confidence

Daily MLS O3 observation (VMR)-Daily climatology

ARCTIC POLAR CAP

SOFIE NO data !

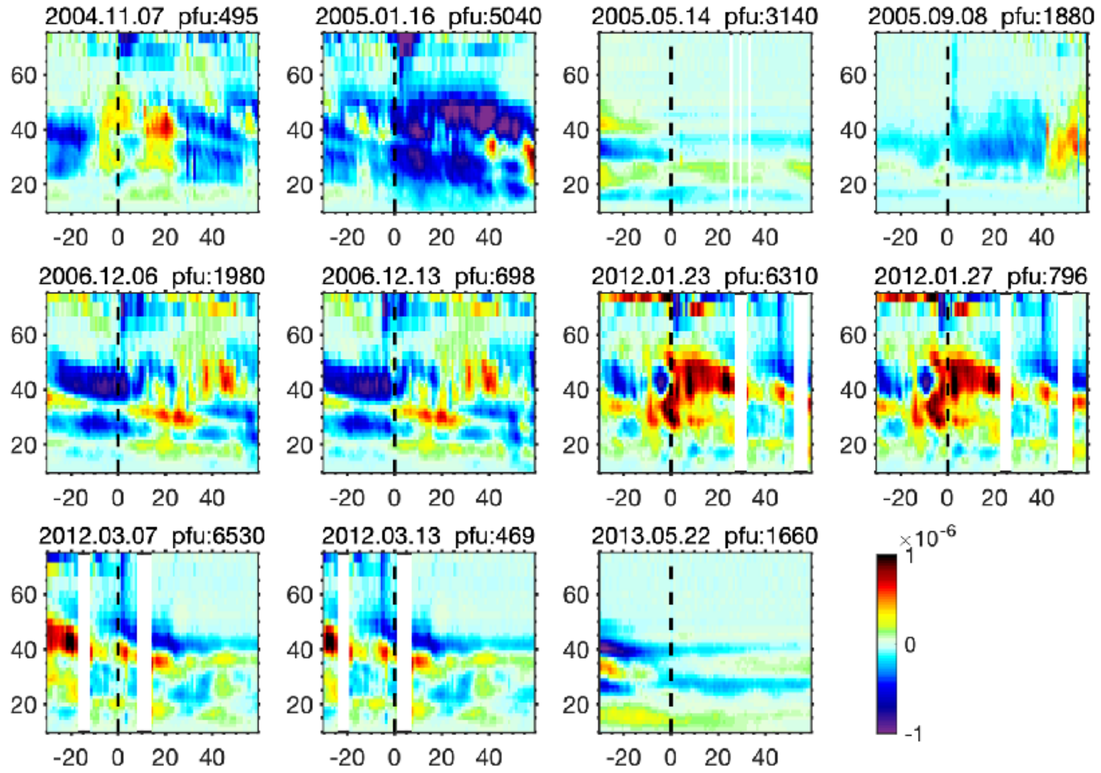


SPE sorted by date

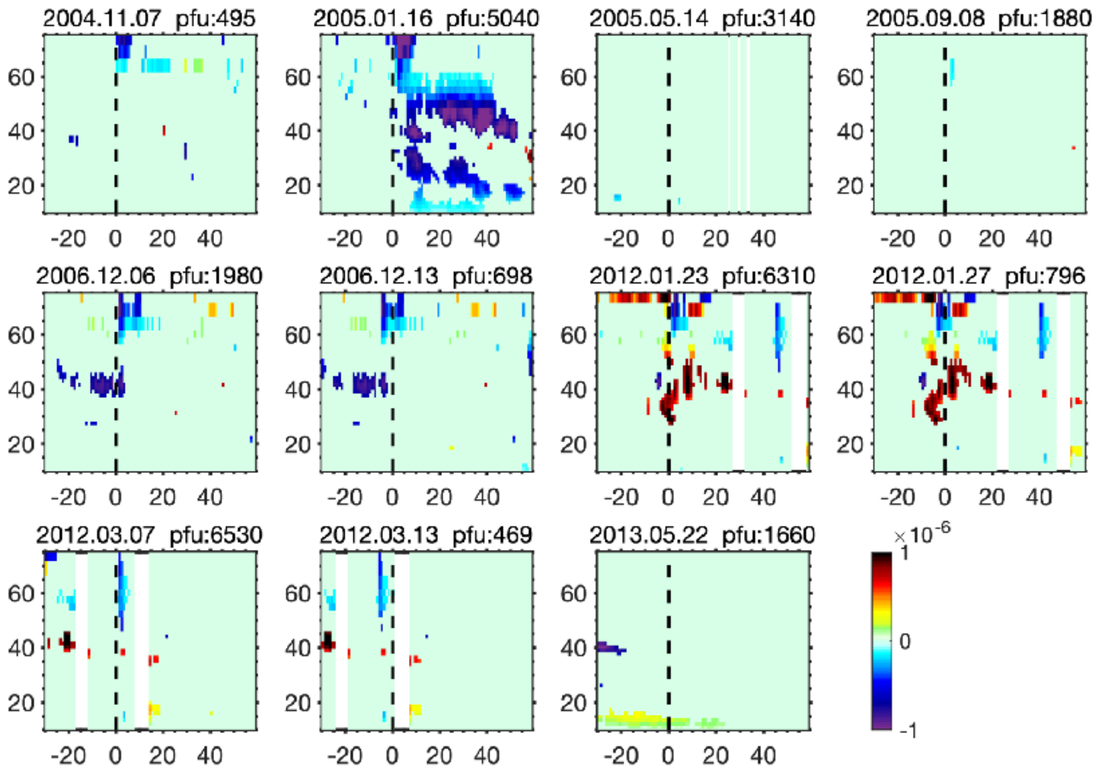
95% confidence

Daily SOFIE NO observation (ND)-Daily climatology / Daily climatology

ARCTIC POLAR CAP



95% confidence



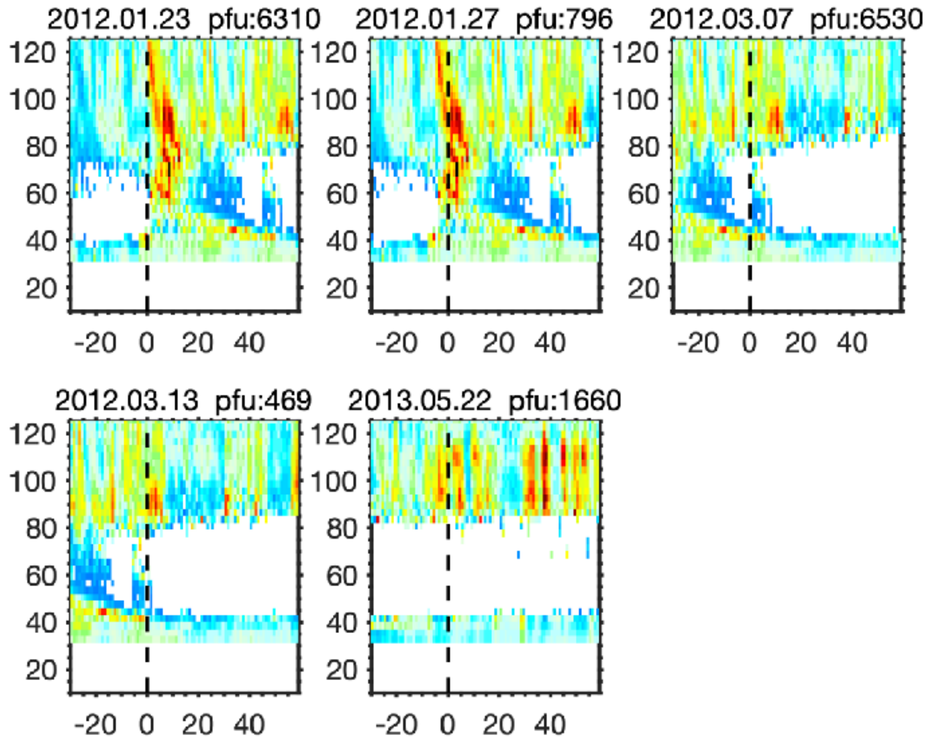
Events with pfu>400

SPE sorted by date

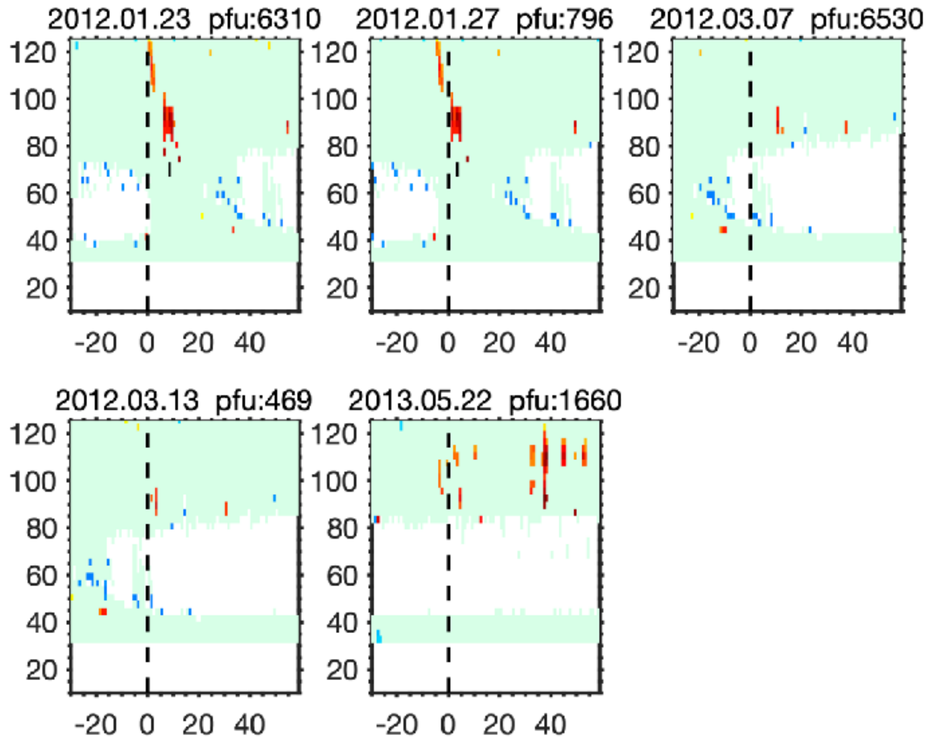
Daily MLS O3 observation (VMR)-Daily climatology

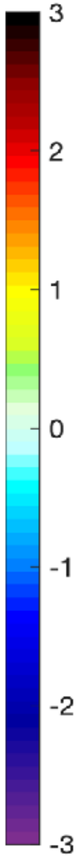
ARCTIC POLAR CAP

SOFIE NO data !



95% confidence



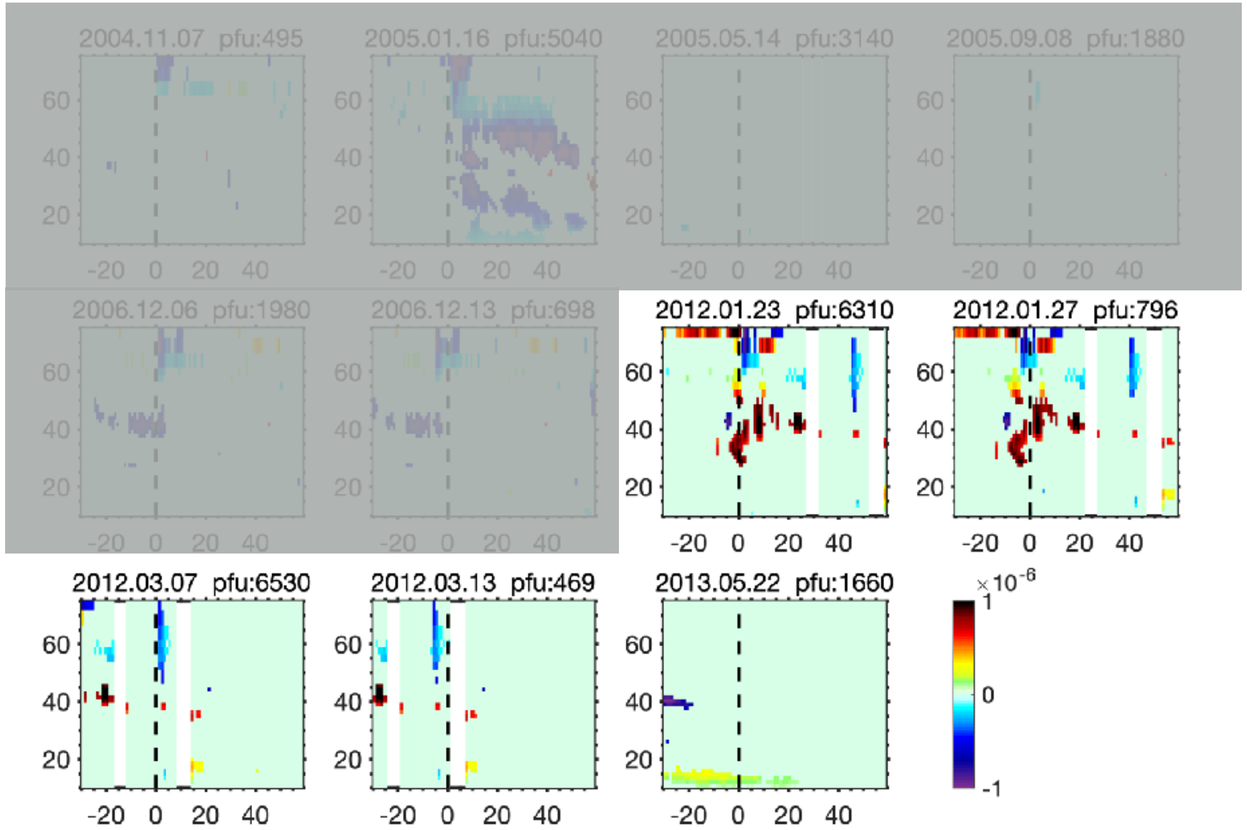


Events with pfu>400

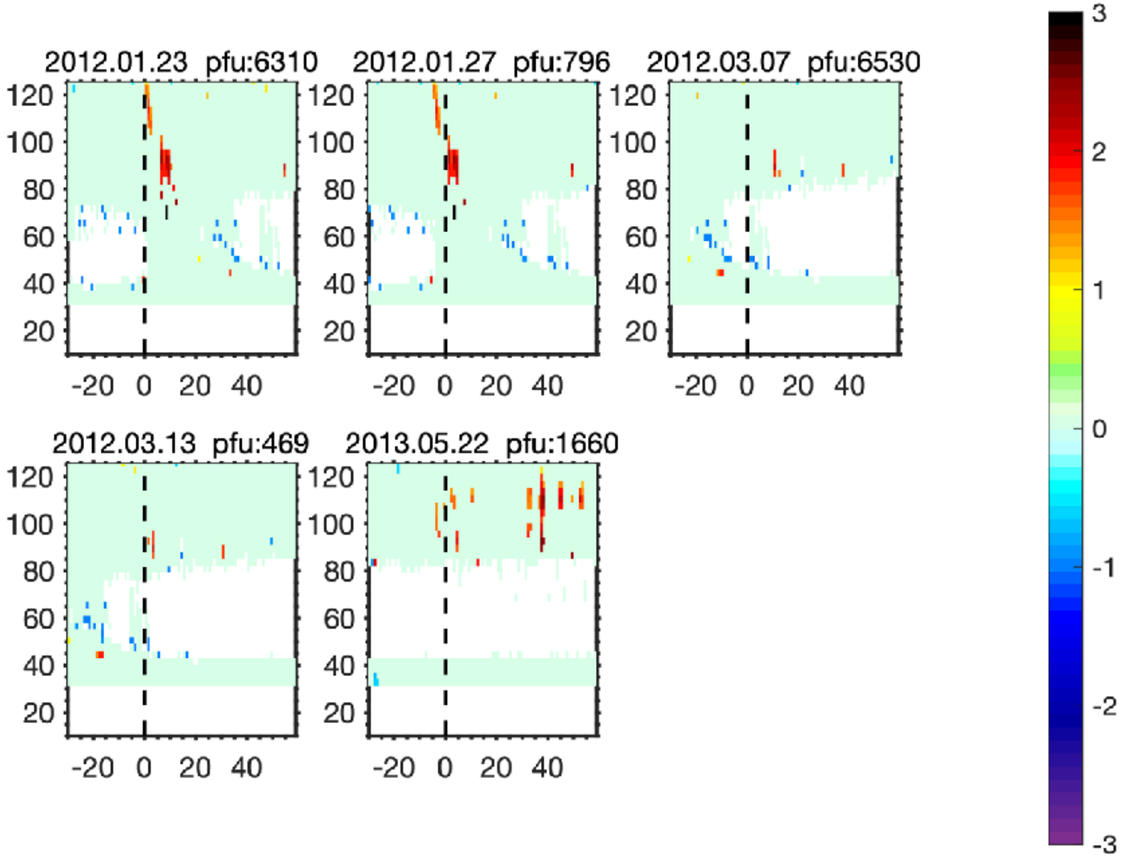
SPE sorted by date

ARCTIC POLAR CAP

MLS ozone



SOFIE NO

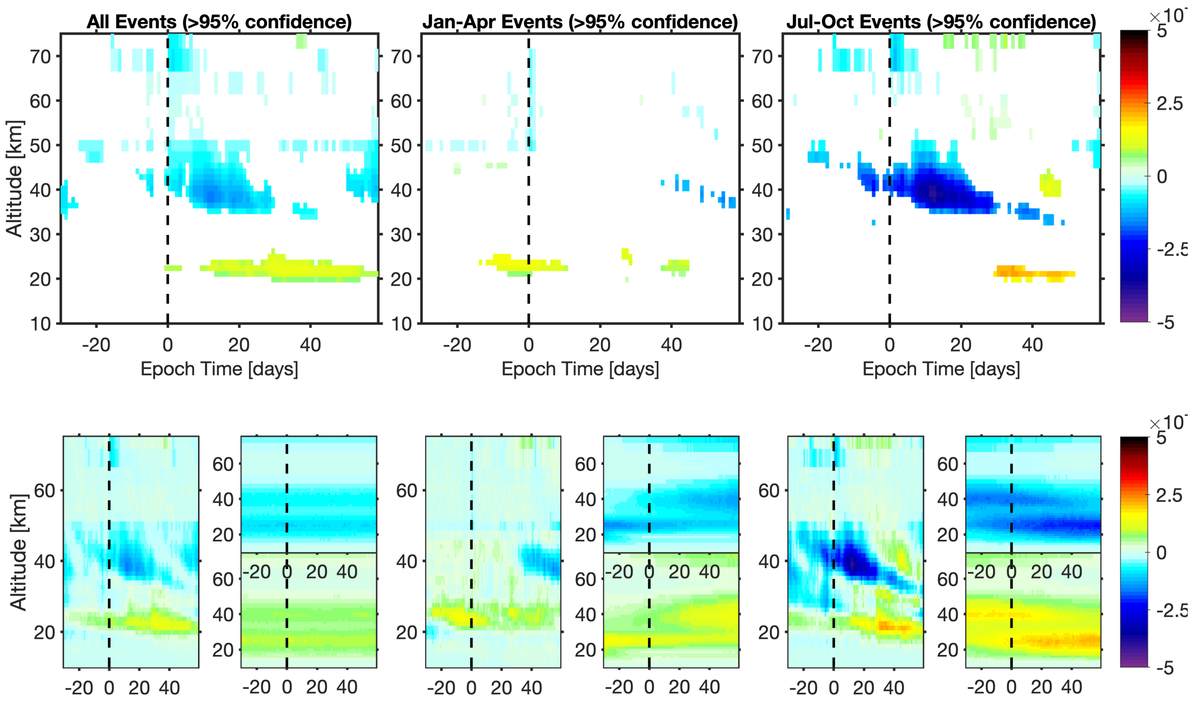


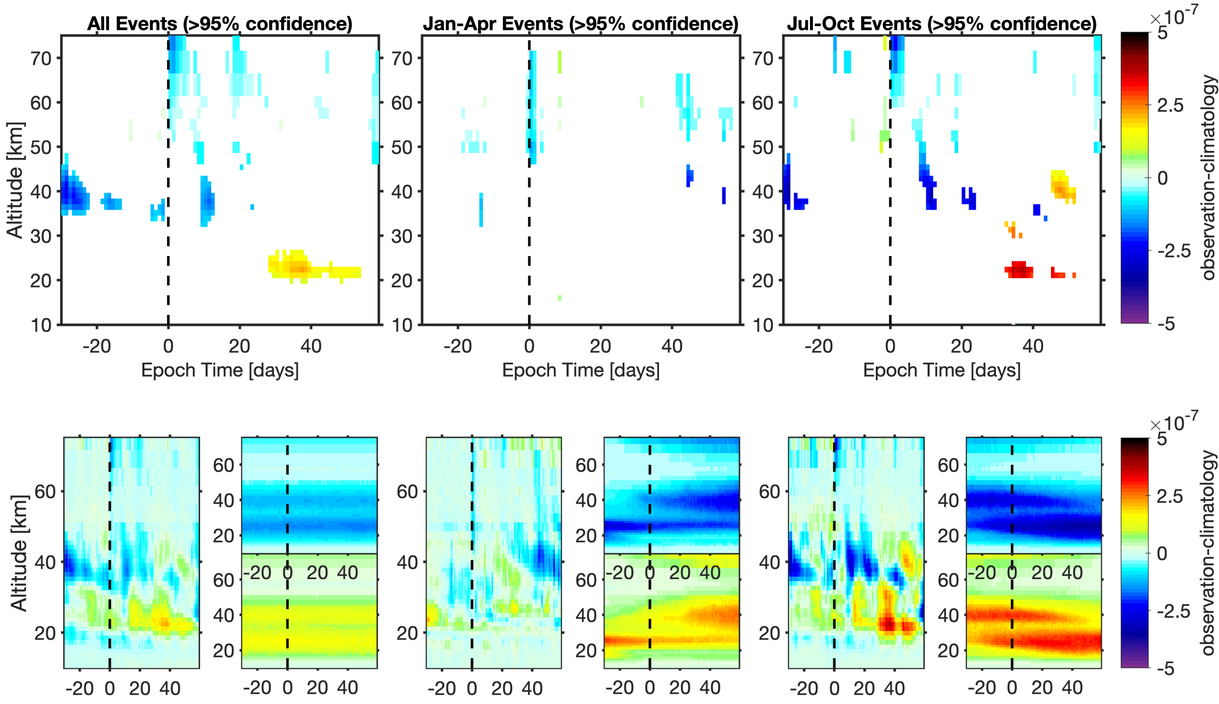
Events with pfu>400

SPE sorted by date

Antarctic Polar Cap:

60°S – 90°S



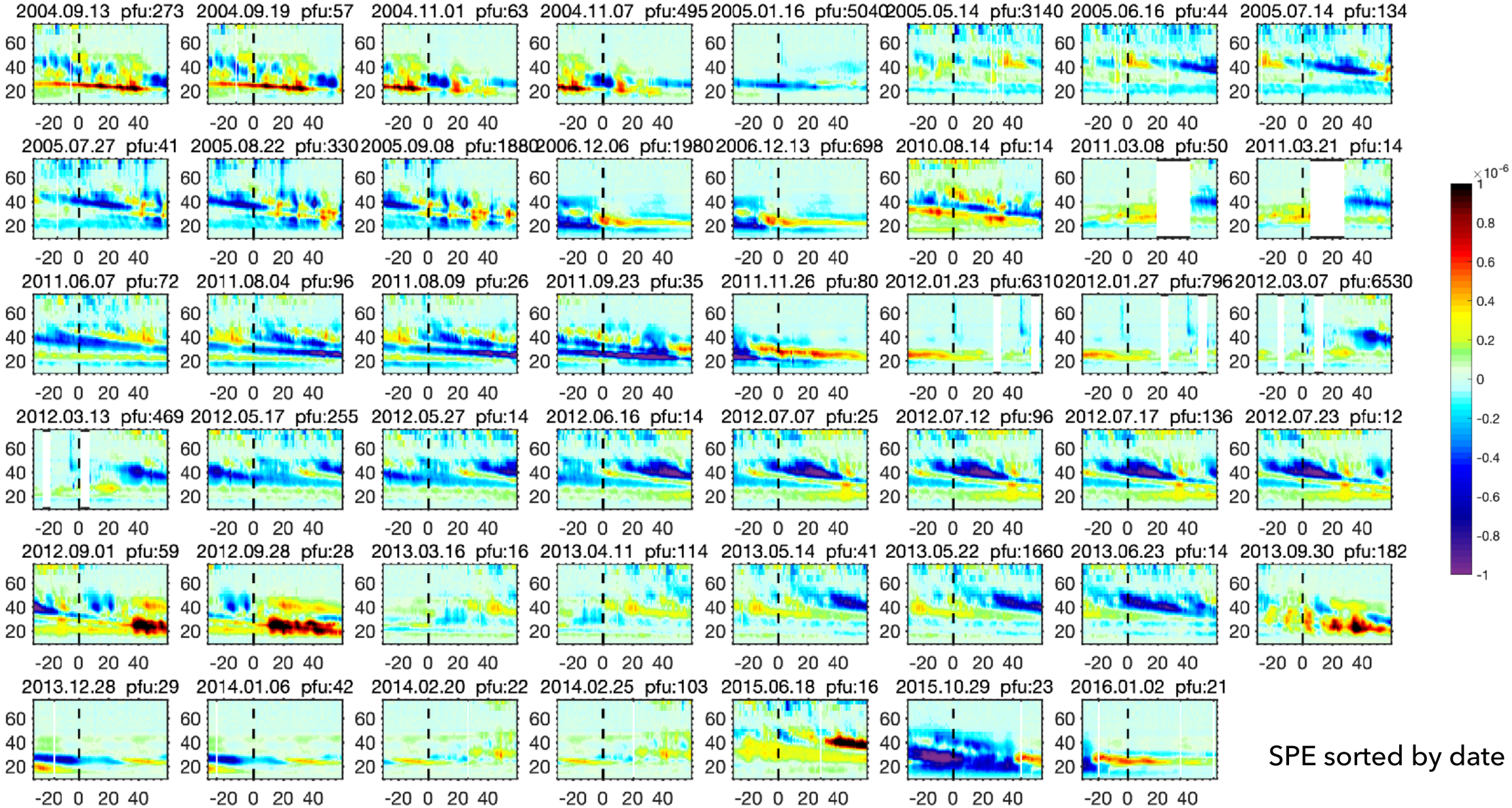


SPE NO. 47 13 18 17 4 7

No restriction

Energy>50pfu & no overlap in 10 days

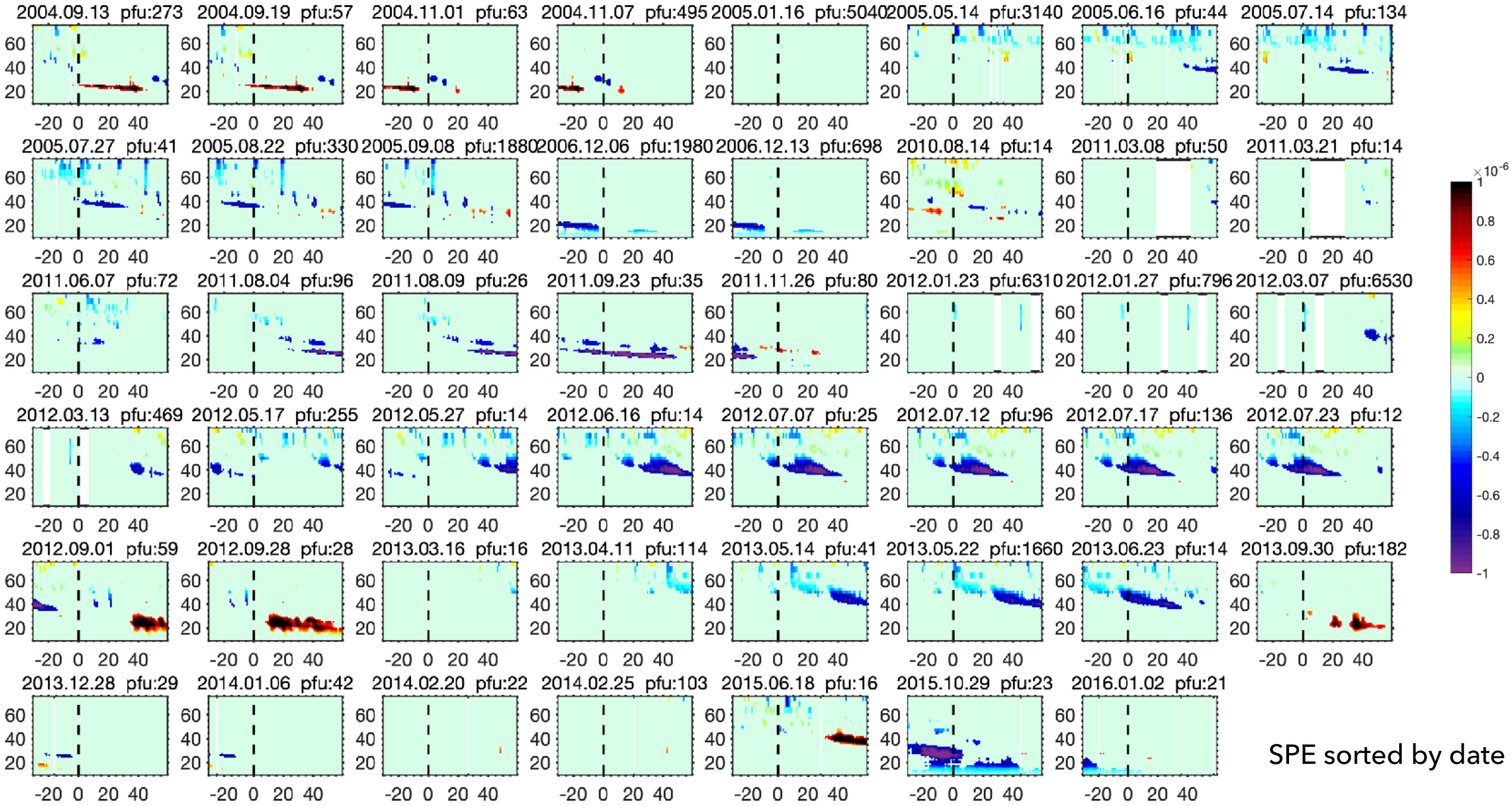
ANTARCTIC POLAR CAP



SPE sorted by date

Daily MLS O3 observation (VMR)-Daily climatology

ANTARCTIC POLAR CAP



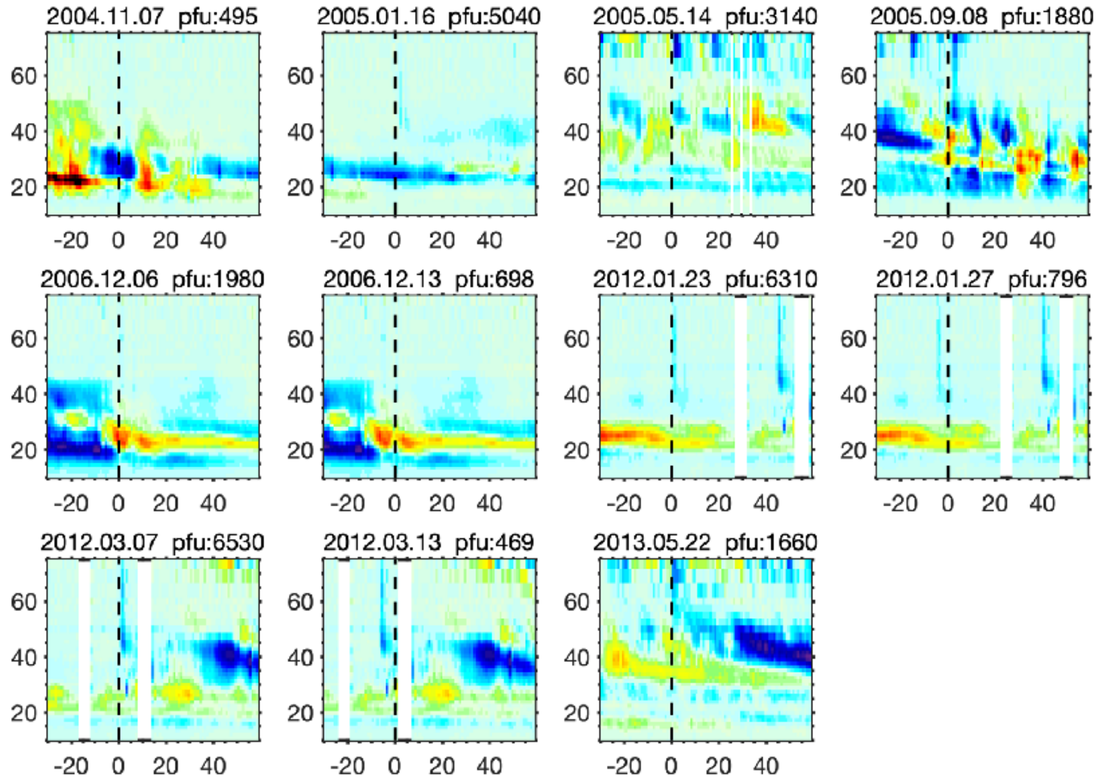
SPE sorted by date

95% confidence

Daily MLS O3 observation (VMR)-Daily climatology

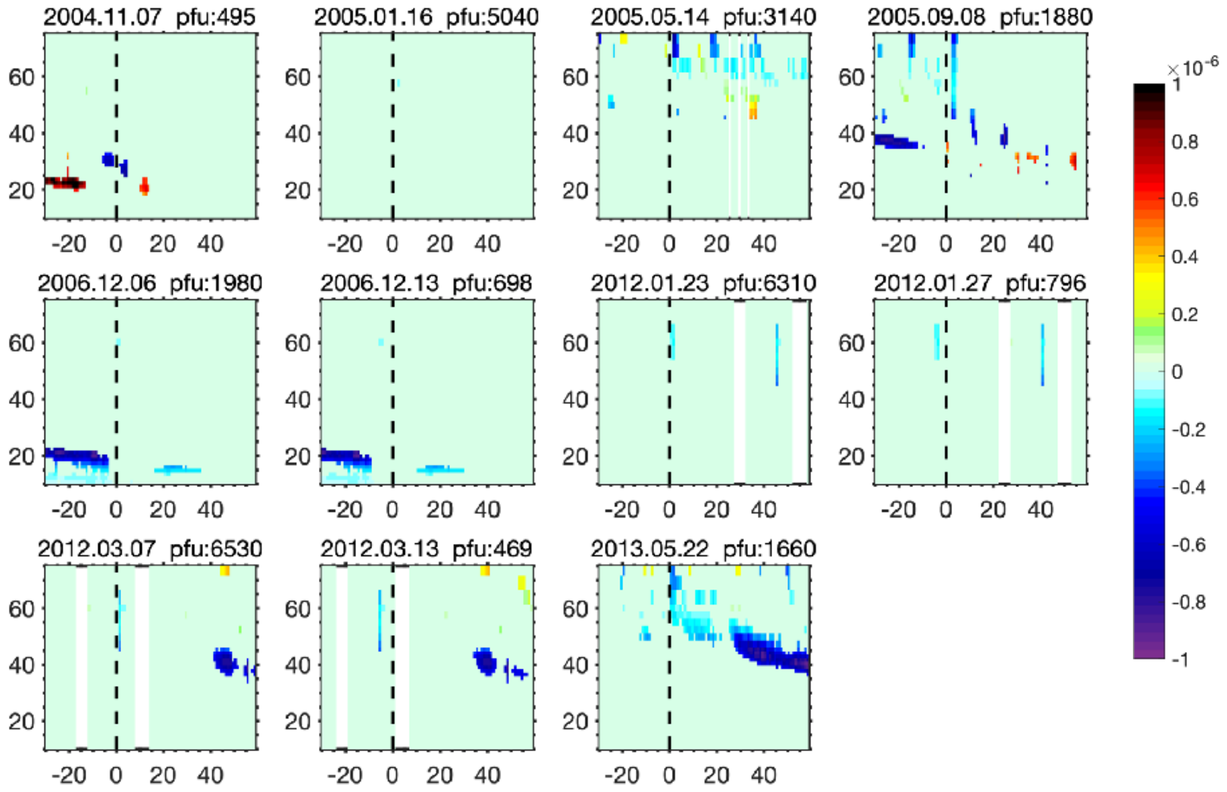
ANTARCTIC POLAR CAP

Superposed epoch



Superposed epoch

95% confidence



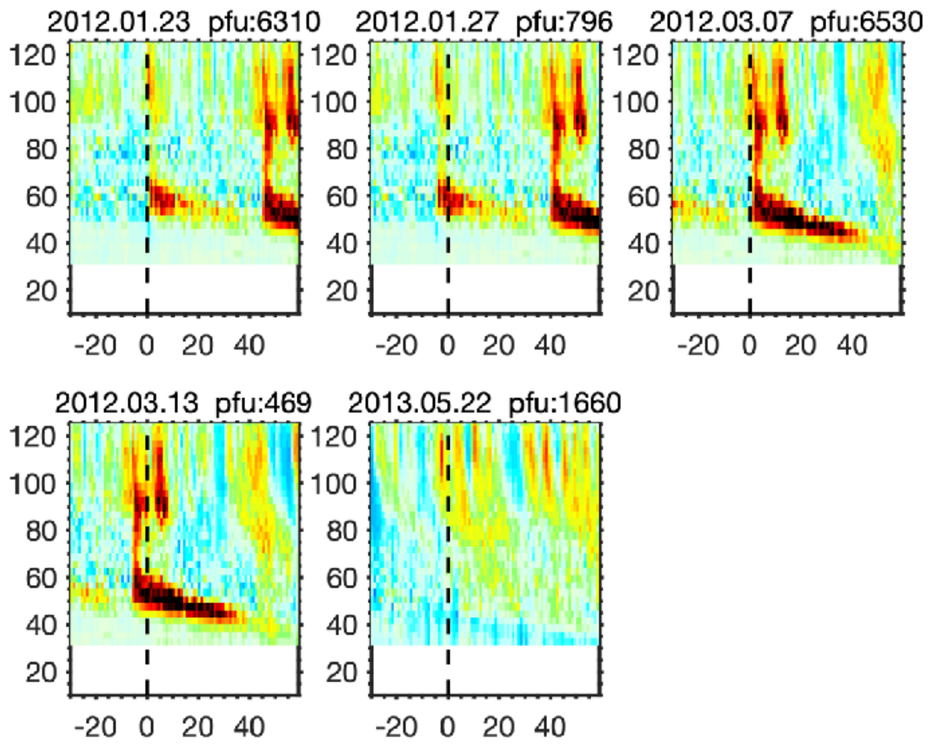
Events with pfu>400

SPE sorted by date

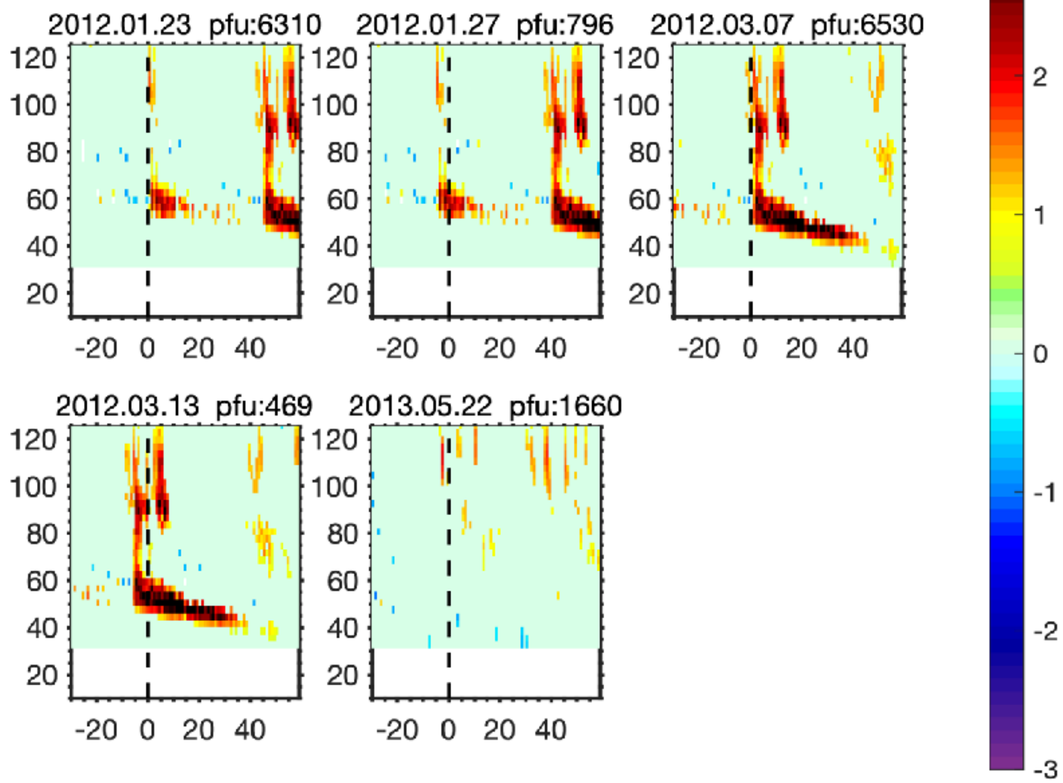
Daily MLS O3 observation (VMR)-Daily climatology

ARCTIC POLAR CAP

SOFIE NO data !



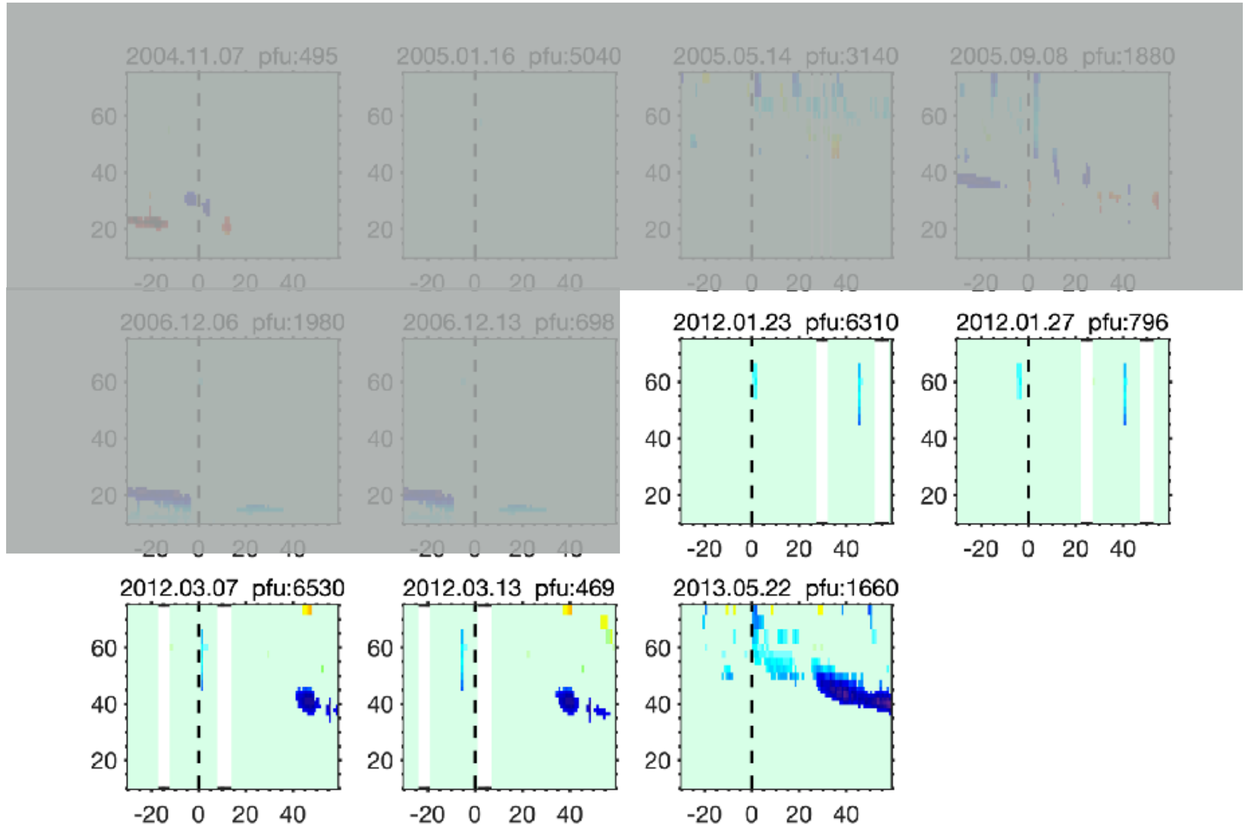
95% confidence



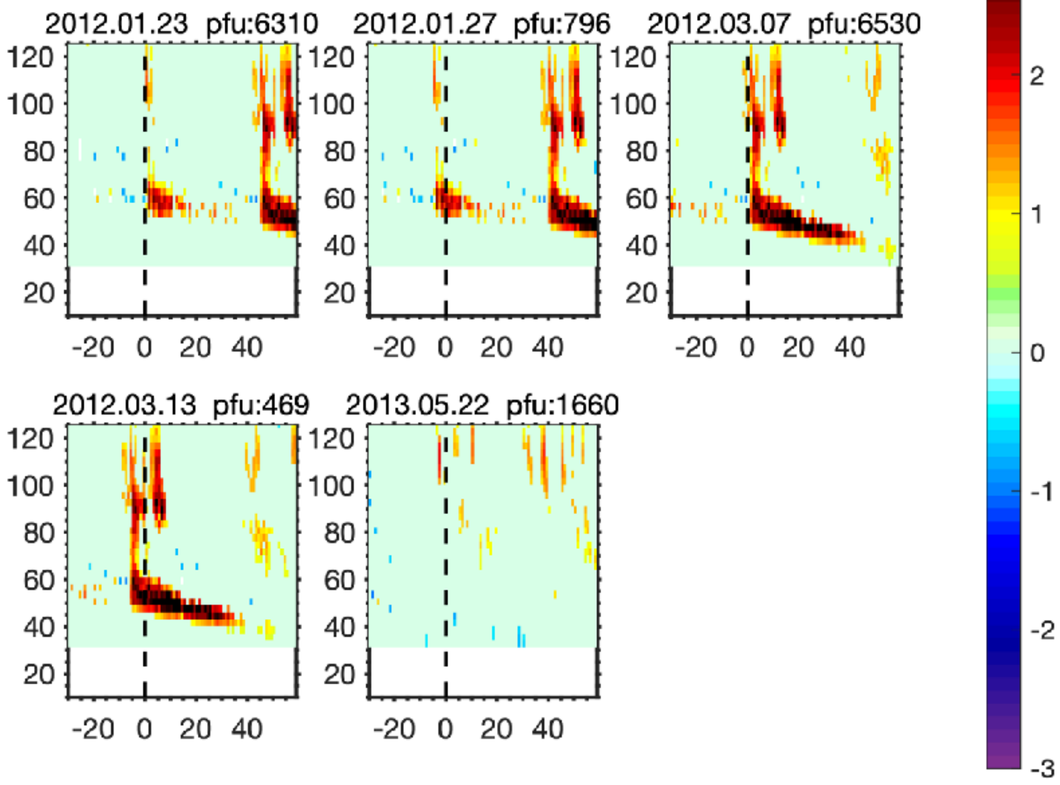
Events with pfu>400

SPE sorted by date

ARCTIC POLAR CAP



95% confidence

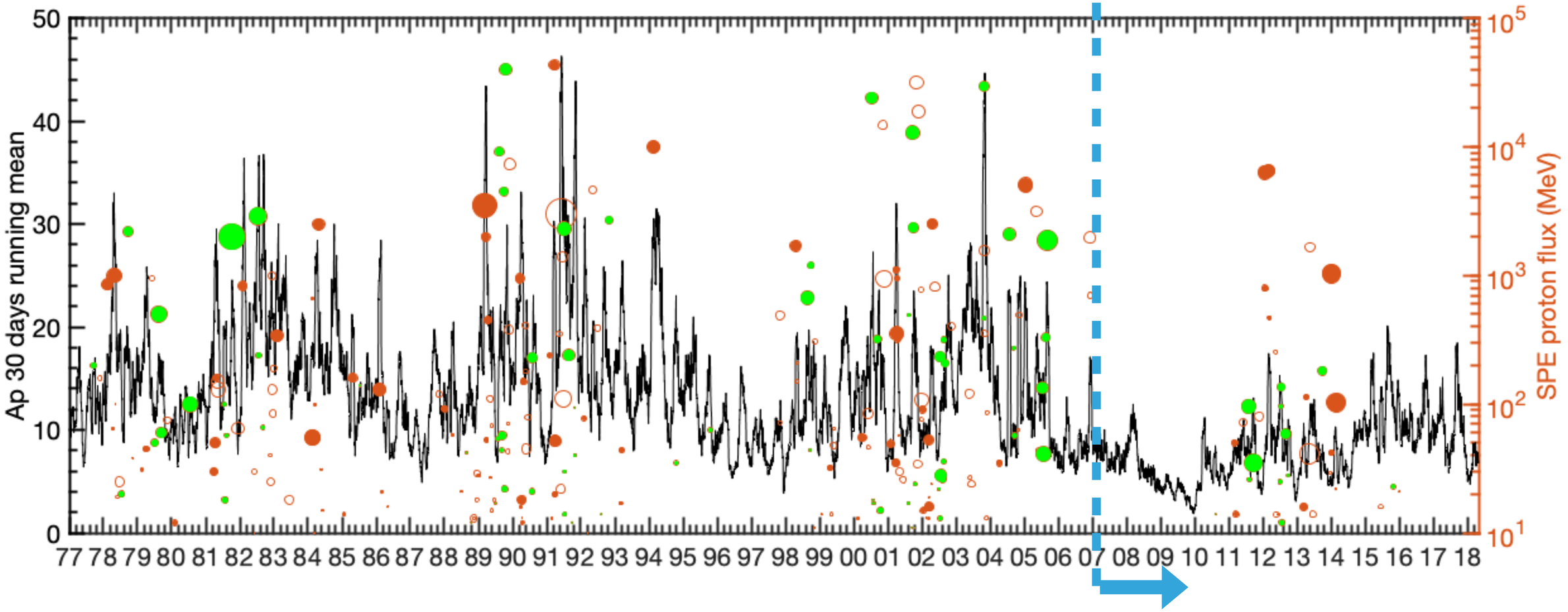


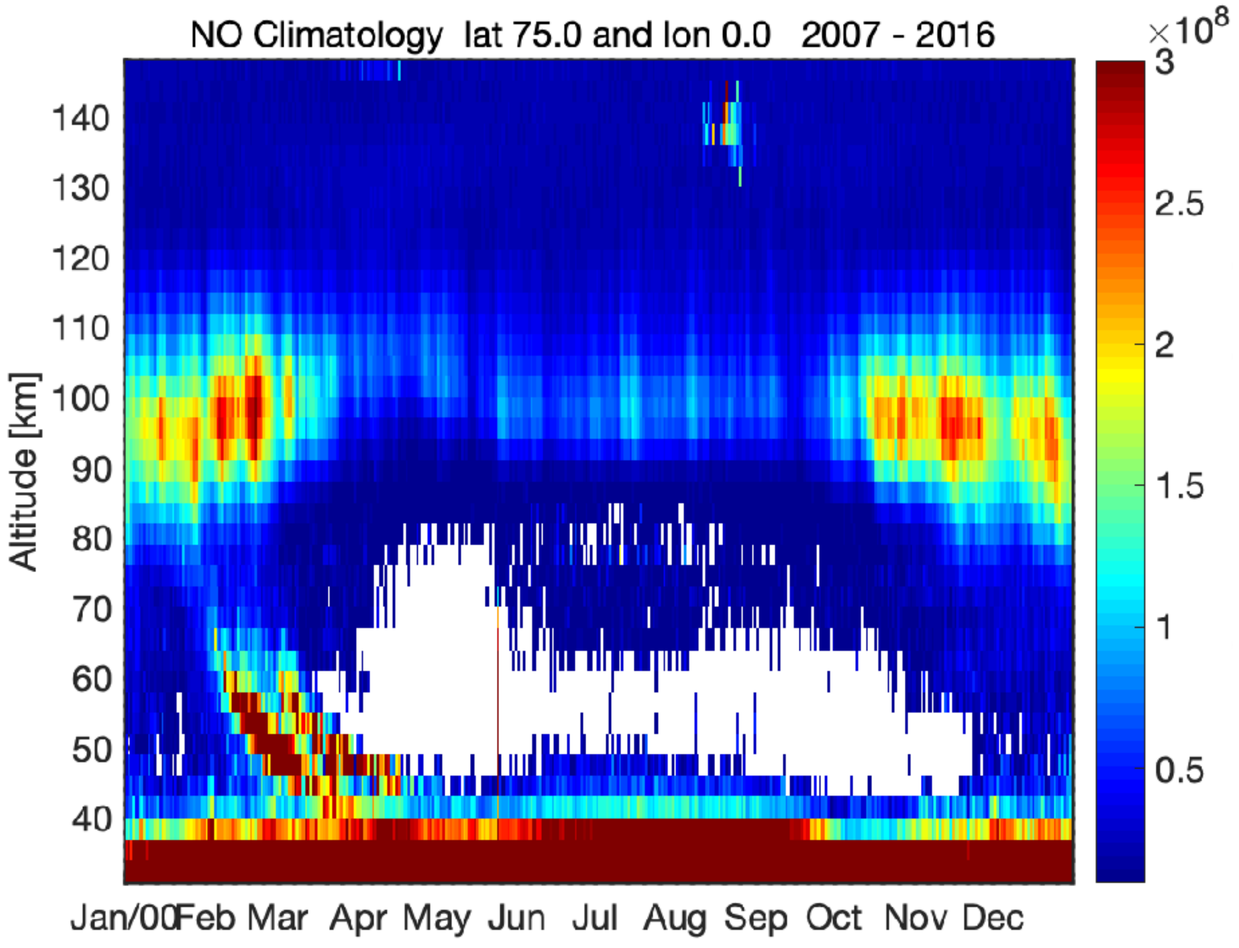
Events with pfu>400

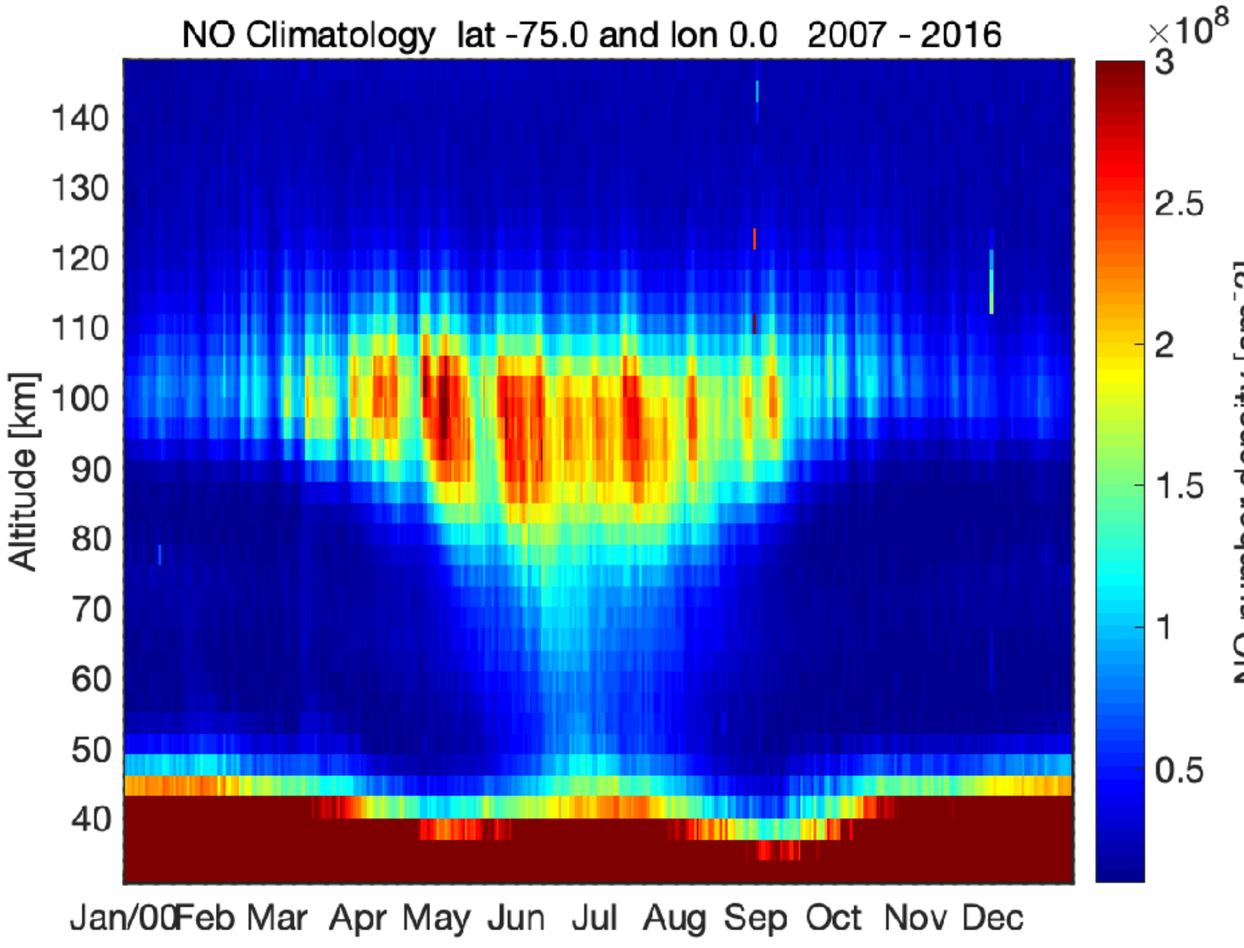
SPE sorted by date

NUMBER OF SPE DURING SOFIE OPERATIONAL TIME

: Winter case : Summer case Size: duration of SPEs

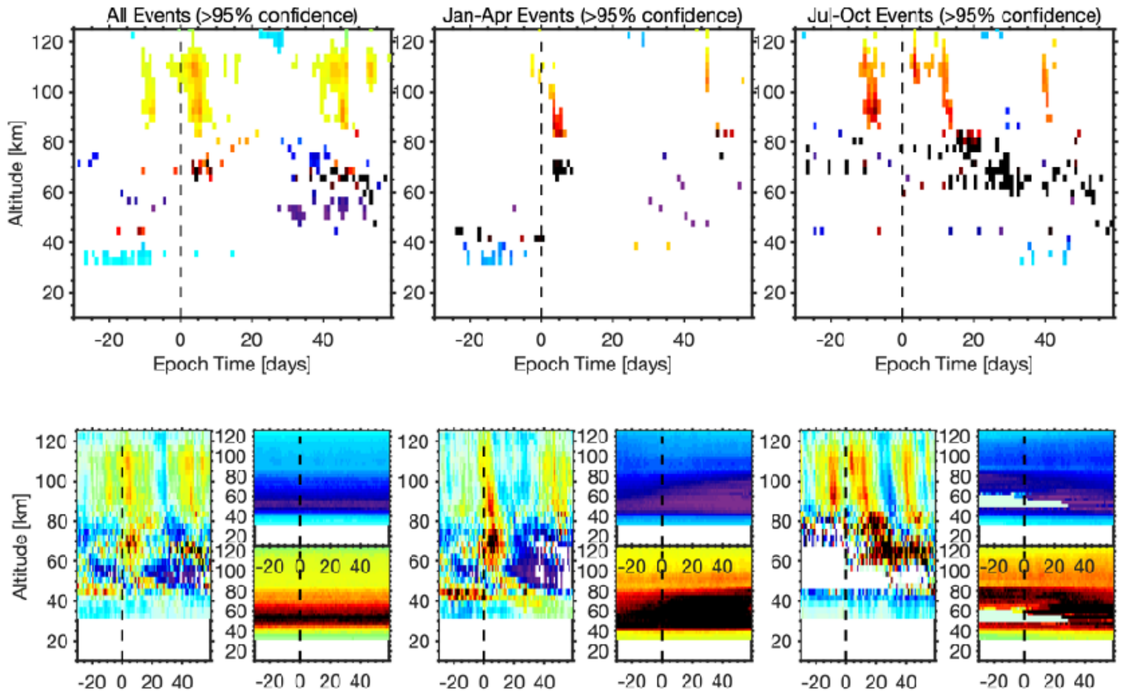


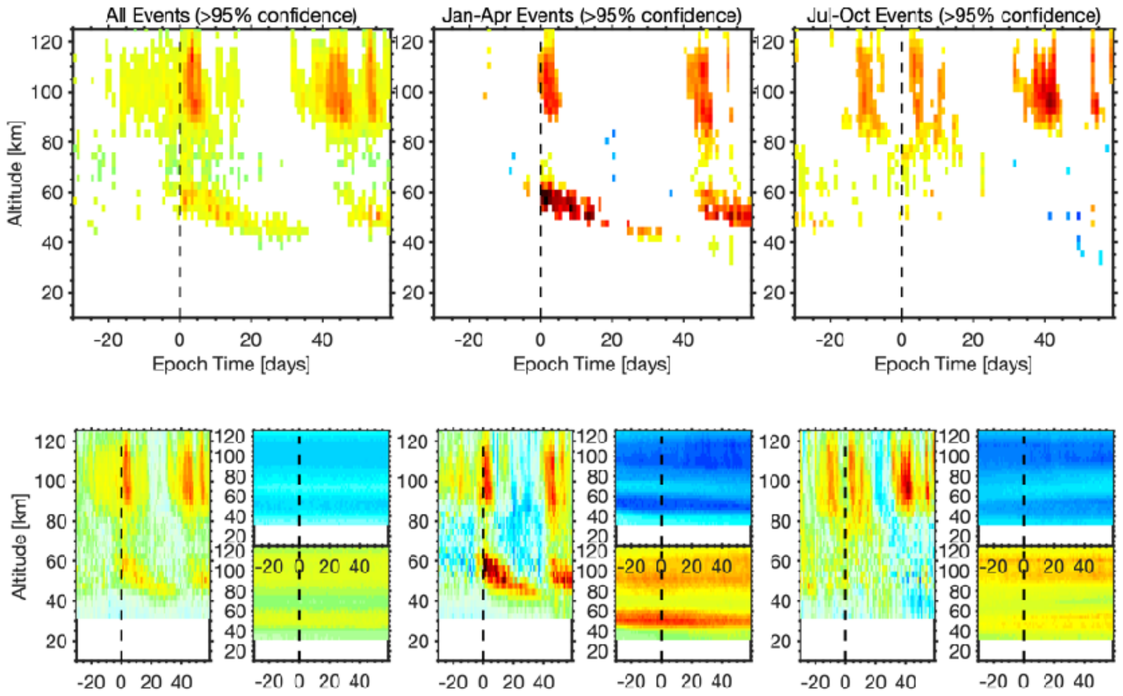

NO Climatology lat 75.0 and lon 0.0 2007 - 2016
×10^8
3
2.5
2
1.5
1
0.5
Altitude [km]
140
130
120
110
100
90
80
70
60
50
40
Jan/00 Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


NO Climatology lat -75.0 and lon 0.0 2007 - 2016
×10^8
3
2.5
2
1.5
1
0.5
NO number density [cm^-3]
Altitude [km]
140
130
120
110
100
90
80
70
60
50
40
Jan/00 Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Arctic Polar Cap NO:

Antarctic Polar Cap NO:



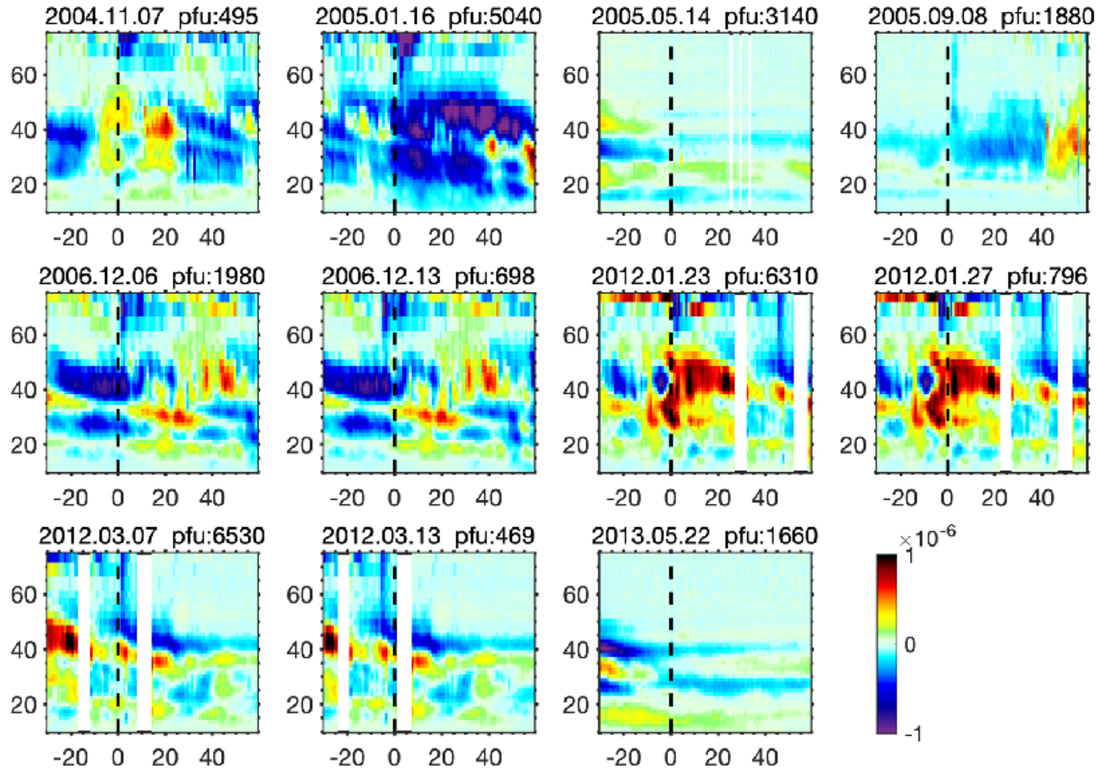


SPE NO. 34 12 12 34 12 12

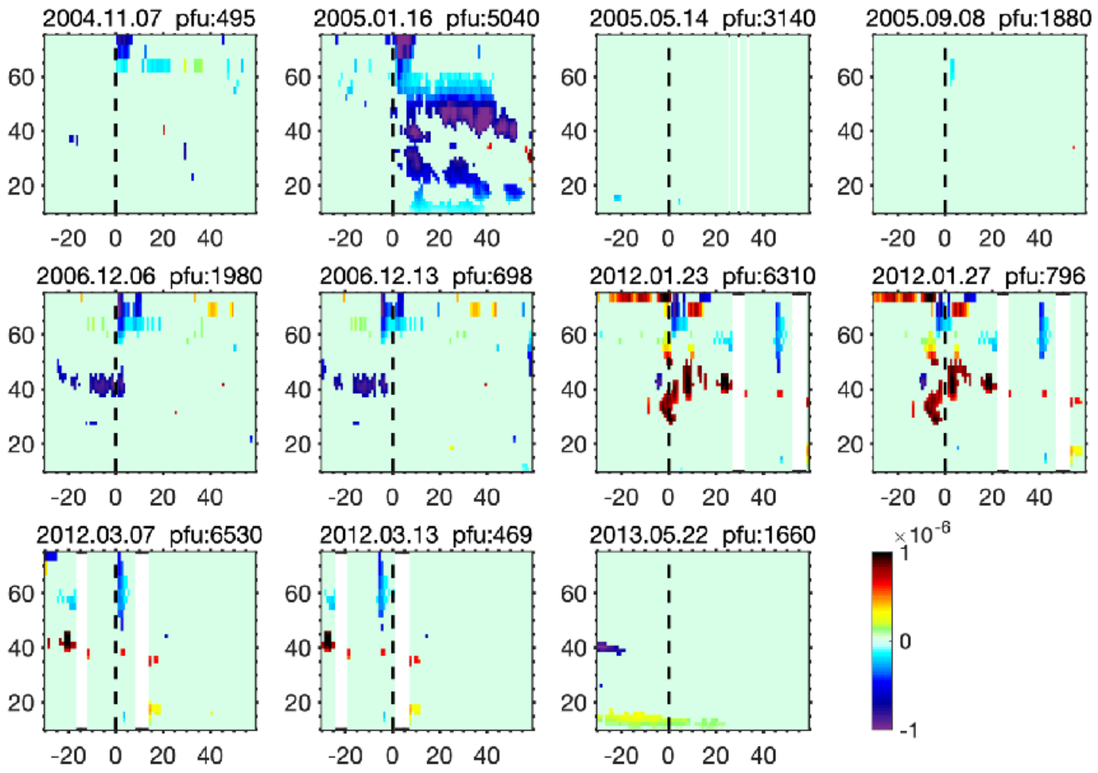
No restriction **No restriction**

Thank you

ARCTIC POLAR CAP



95% confidence

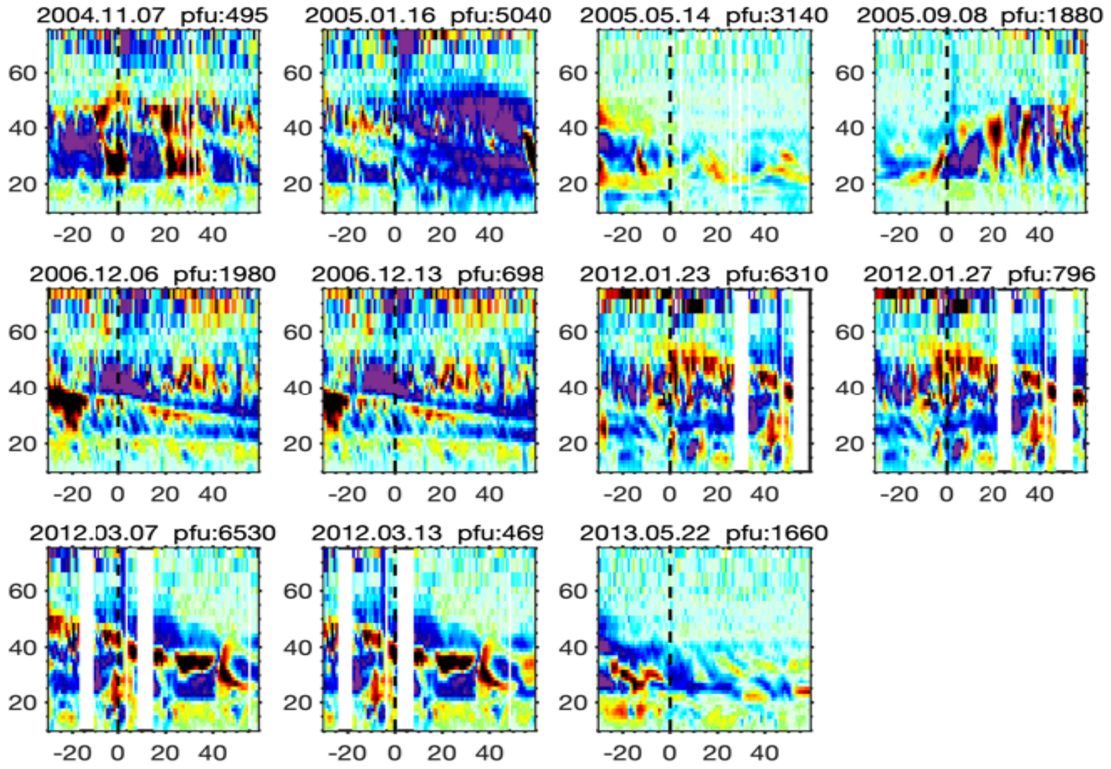


Events with pfu>400

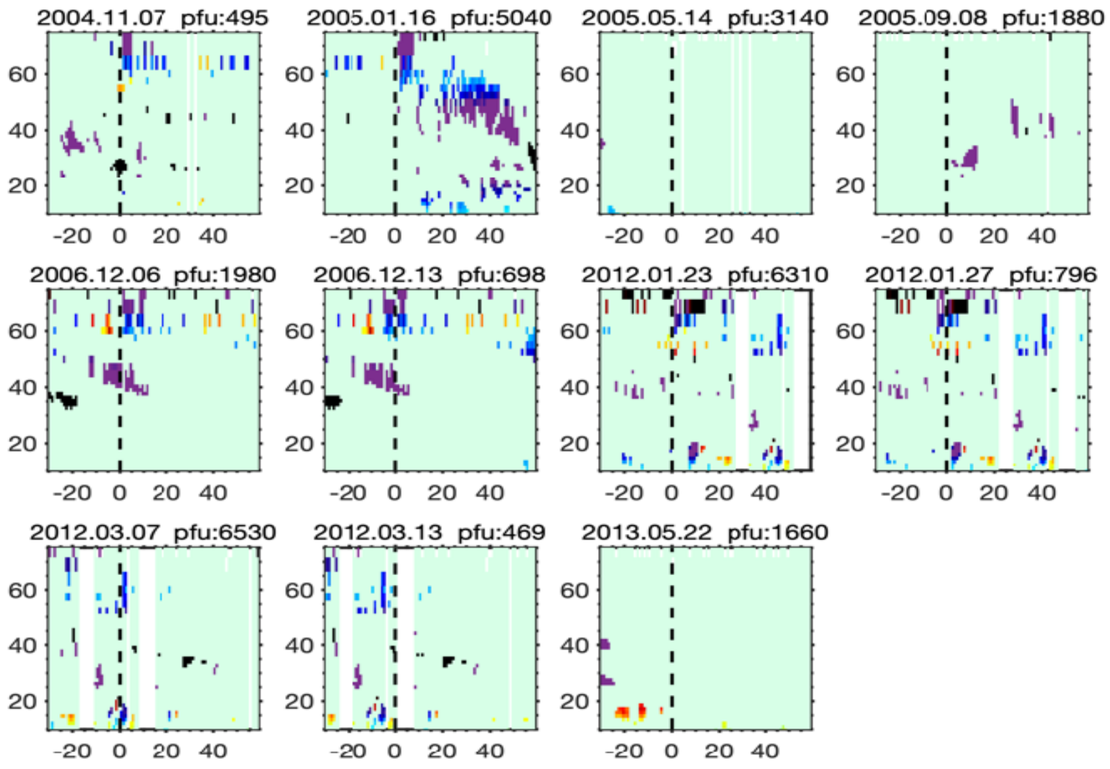
SPE sorted by date

Daily MLS O3 observation (VMR)-Daily climatology

NY-ALESUND



95% confidence



Events with pfu>400

SPE sorted by date

Daily MLS O3 observation (VMR)-Daily climatology