

Figure S1 Geographical distribution of all discontinuities (yellow – no discontinuity, red – discontinuity) for MERRA 2 (upper panel) and ERA 5 (lower panel) at 250hPa for April.

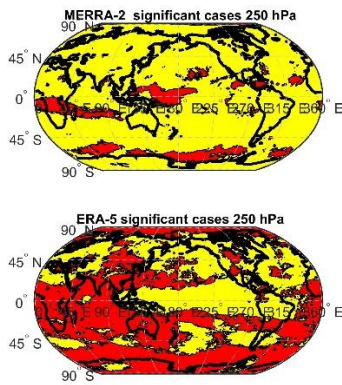


Figure S2 Geographical distribution of the significant discontinuities for MERRA 2 (upper panel) and ERA 5 (lower panel) at 250hPa for May.

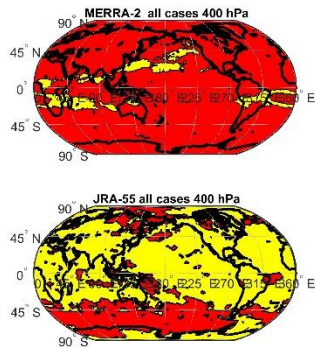


Figure S3 Geographical distribution of all discontinuities for MERRA-2 (upper panel) and ERA-5 (lower panel) at 400hPa for March.

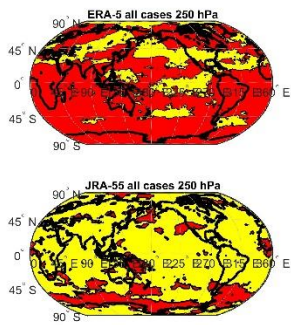


Figure S4: Geographical distribution of all discontinuities for ERA-5 (upper panel) and JRA-55 (lower panel) at 250 hPa for June.

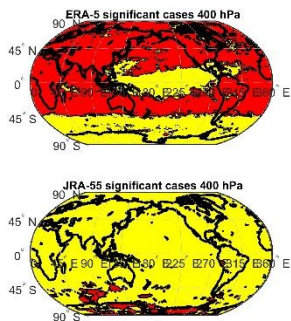


Figure S5: Geographical distribution of the significant discontinuities for ERA-5 (upper panel) and JRA-55 (lower panel) at 400 hPa for December.

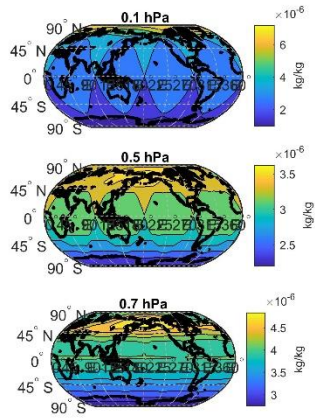


Figure S6 Average ozone concentration in January from MERRA-2 at 0.1 hPa (upper panel), 0.5 hPa (middle panel) and 0.7 hPa (lower panel).

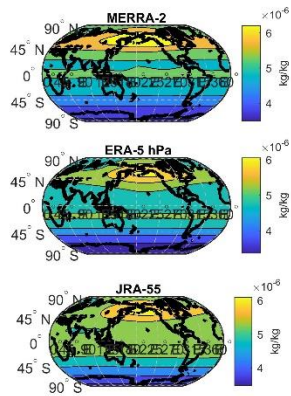


Figure S7 Average ozone concentration in January at 1 hPa from MERRA-2 (upper panel), ERA-5 (middle panel) and JRA-55 (lower panel).

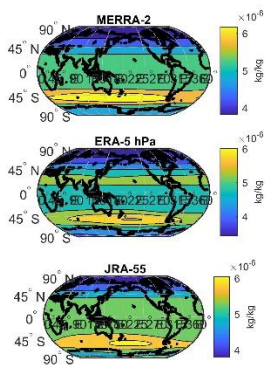


Figure S8 The same as fig. S7, but for July.

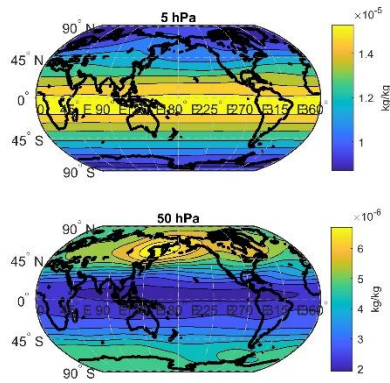


Figure S9 Average ozone concentration in January from MERRA-2 at 5 hPa (upper panel) and 50 hPa (lower panel).

Table S1 The differences in the discontinuity occurrence between MERRA-2 and JRA-55 in a certain month for all (left column) and significant (right column) discontinuities. The positive difference means higher number of discontinuities in MERRA-2 than in JRA-55.

hPa	January		February		March		April		May		June	
	All	Sig.	All	Sig.	All	Sig.	All	Sig.	All	Sig.	All	Sig.
1	-4.0	48.8	9.1	52.0	-1.0	54.2	-2.4	42.8	-7.4	57.5	-10.1	37.5
2	-22.7	17.9	-46.8	3.2	-42.2	11.2	-34.8	29.4	-18.5	36.4	-23.0	23.9
3	-32.4	-16.9	-44.6	-9.9	-71.7	-22.5	-60.0	-3.2	-4.8	4.1	-41.5	4.9
5	-31.9	7.4	-41.2	17.7	-48.7	-6.7	-79.5	-6.1	-70.4	-1.4	-60.9	-9.7
7	-15.1	-5.6	-21.6	-8.5	-33.8	-6.8	-50.5	-9.4	-40.9	-23.6	-26.6	-24.6
10	31.1	-2.6	16.2	-6.9	13.3	-2.5	-12.2	-2.4	-17.8	-11.4	-7.9	-19.4
20	7.8	5.3	7.0	5.7	13.3	6.5	10.7	2.1	4.9	0.4	3.9	0.3
30	18.5	4.8	15.6	4.7	21.8	5.8	35.3	-0.9	32.6	7.3	29.1	10.8
50	10.6	3.7	13.3	6.7	16.6	12.9	19.8	7.3	30.0	15.8	28.3	11.5
70	15.9	15.8	12.6	14.3	12.6	18.3	25.7	22.8	47.9	43.7	43.5	43.6
100	21.1	19.0	17.0	8.9	21.1	2.5	28.2	4.3	31.4	3.7	45.6	14.8
150	26.2	14.1	12.0	2.7	16.4	-1.0	25.7	2.5	21.2	-2.4	33.8	5.0
200	7.7	8.6	16.2	19.7	15.4	8.9	21.7	9.7	26.5	10.4	34.5	15.2
250	7.5	-0.3	16.6	5.8	14.5	3.2	12.9	3.4	13.8	3.7	18.5	3.1
300	37.4	8.0	43.5	6.9	42.7	-0.5	37.7	0.7	25.2	2.5	15.1	-3.7
350	48.1	10.0	58.5	10.6	62.8	4.2	59.5	4.6	39.2	0.5	23.8	-5.0
400	51.0	11.5	61.1	12.9	64.8	8.4	62.5	2.2	37.8	3.0	27.4	-3.7
450	49.8	13.3	55.1	11.0	60.1	9.9	64.5	1.8	46.0	16.6	31.9	2.9
500	43.3	1.5	50.5	2.6	53.8	9.9	57.3	3.0	46.6	21.9	49.2	12.8

Table S1 continuation

hPa	July		August		September		October		November		December	
	All	Sig.	All	Sig.	All	Sig.	All	Sig.	All	Sig.	All	Sig.
1	-3.3	60.0	-0.8	66.7	-1.7	64.6	-2.2	84.9	2.3	81.2	0.0	49.0
2	-29.4	37.6	-21.0	26.5	-22.7	39.4	-21.4	59	-34.8	27.9	-31.8	-10.9
3	-52.1	2.3	-73.2	-12.3	-72.1	-5.6	-57.7	17.9	-43.7	6.0	-16.5	-7.3
5	-52.9	-10.3	-73.2	-15.4	-84.2	-7.4	-67.1	-3.3	-81.3	1.0	-33.2	-3.1
7	-22.8	-20.6	-58.5	-22.8	-67.5	-16.5	-56.5	-11.8	-27.3	-5.8	-13.6	-14.4
10	1.8	-13.4	-1.0	-13.0	-13.0	-11.0	-9.5	-8.6	14.3	-0.2	17.6	-3.0
20	-0.5	4.0	-7.3	-0.6	7.9	5.4	12.4	3.5	23.4	12.1	25.5	12.3
30	22.8	6.7	19.6	10.9	21.9	17.3	25.6	9.3	27.1	9.4	18.6	9.9
50	25.7	14.6	18.6	7.7	18.0	11.9	30.6	14.3	20.7	12.2	18.6	13.6
70	34.4	39.7	32.3	23.1	19.1	24.0	32.3	30.6	29.1	20.7	14.2	11.7
100	36.3	6.2	27.6	-2.6	11.0	6.8	12.5	12.9	30.6	6.9	39.0	10.7
150	38.1	13.0	22.5	0.1	25.4	5.5	28.3	11.0	29.9	10.0	40.5	15.1
200	28.8	20.7	10.1	11.9	20.7	5.8	19.6	11.0	16.4	14.3	17.0	9.8
250	13.2	3.7	11.9	1.4	26.1	6.3	20.9	8.5	9.2	3.1	17.8	2.8
300	7.9	-5.8	36.3	-1.6	51.4	8.1	54.8	9.8	60.3	10.2	55.2	17.1
350	22.0	-8.4	52.7	-2.8	62.3	11.0	60.5	18.4	65.0	20.0	69.0	25.6
400	27.4	-2.1	46.2	-1.4	62.8	10.9	65.4	18.8	63.1	18.8	66.9	27.1
450	39.8	13.6	42.0	8.7	57.4	10.5	62.1	17.4	60.2	12.2	65.9	24.6
500	46.6	28.9	40.9	15.7	49.3	7.4	57.0	16.1	53.9	5.0	65.8	8.7

Table S2: The same as previous tables, but for ERA-5 and JRA-55 differences. The positive difference means higher number of discontinuities in ERA-5 than in JRA-55.

hPa	January		February		March		April		May		June	
	All	Sig.	All	Sig.	All	Sig.	All	Sig.	All	Sig.	All	Sig.
1	-1.7	40.3	-19.4	12.6	-12.3	28.7	-12.9	35.0	2.5	64.7	-13.3	50.7
2	2.5	43.1	4.4	58.5	-2.4	52.0	-6.7	57.9	1.1	80.1	5.6	91.6
3	5.0	42.3	2.5	44.8	-6.7	38.1	-19.1	55.5	-9.0	67.5	-2.9	79.7
5	-40.3	18.4	-60.1	-6.7	-71.6	-6.9	-70.7	3.6	-55.4	15.7	-54.6	-9.3
7	-29.7	0.9	-34.5	8.2	-23.8	12.9	-17.4	0.8	12.3	13.8	29.5	38.1
10	30.0	19.8	8.6	13.8	4.3	16.0	15.2	13.1	13.6	6.3	21.6	-2.5
20	-2.5	6.9	7.9	15.0	27.1	7.6	16.5	7.8	27.3	12.2	34.6	20.4
30	14.5	4.3	8.4	4.5	19.5	3.3	43.3	2.1	44.0	12.9	44.1	13.4
50	18.8	8.8	7.9	6.7	12.3	19.3	18.4	18.7	17.5	16.4	23.2	23.5
70	10.2	14.9	-0.6	12.5	7.6	13.2	16.9	14.9	37.1	26.2	36.4	31.7
100	36.8	26.3	36.7	18.6	23.4	5.3	22.3	6.1	39.4	5.9	40.3	12.1
125	11.4	16.4	19.1	13.8	23.8	3.8	36.8	9.0	42.6	9.3	41.9	19.1
150	11.4	13.8	3.9	7.8	21.3	6.1	23.6	9.0	32.8	7.1	38.5	15.1
175	3.9	8.4	-8.8	8.6	-0.3	5.8	6.6	10.0	7.6	5.6	6.8	11.1
200	12.2	15.5	16.3	19.8	27.0	21.4	35.5	18.8	43.8	27.9	43.6	30.7
225	26.6	28.4	36.6	32.8	46.7	42.8	52.5	41.2	54.7	46.3	58.8	45.9
250	29.7	36.6	41.2	37.9	53.6	48.0	54.4	47.2	54.0	52.8	58.7	45.2
300	33.0	38.1	35.6	32.2	51.3	38.3	44.5	38.3	37.9	41.4	48.0	40.9
350	39.1	39.3	35.8	30.0	34.3	33.3	29.0	33.8	27.1	38.6	35.4	39.3
400	36.5	37.3	33.7	29.4	29.1	29.8	24.8	30.3	25.8	36.0	34.5	37.0
450	37.6	34.8	36.7	37.2	19.4	25.8	25.6	26.9	21.5	30.8	26.6	33.3
500	40.1	32.2	39.2	26.6	22.0	21.5	27.4	24.9	21.1	29.1	25.5	30.6

Table S3 continuation

hPa	July		August		September		October		November		December	
	All	Sig.	All	Sig.	All	Sig.	All	Sig.	All	Sig.	All	Sig.
1	-6.1	50.7	5.1	54.9	-4.9	56.1	-5.5	68.6	1.4	52.7	0.0	19.5
2	10.3	91.6	5.3	59.0	0.0	76.8	-3.6	77.3	0.0	54.1	13.7	23.1
3	-4.5	79.7	-9.8	51.0	-4.2	60.4	-7.7	59.9	-9.1	28.9	13.9	42.3
5	-67.6	-9.3	-83.3	-15.3	-79.9	-8	-64.8	3.3	-64.8	0.4	-53.9	3.4
7	23.2	38.1	-25.7	5.2	-43.2	-5.4	-36.3	-5.8	-19.4	4.1	-24.2	-9.3
10	39.5	-2.5	28.3	0.3	3.4	-1.8	12.2	-2.3	25.6	4.9	28.5	16.5
20	34.8	20.4	22.8	13.1	16.6	10.9	18.4	10.7	33.4	21.8	26.8	15.1
30	36.9	13.4	9.1	6.4	15.6	4.3	12.4	5.1	13.7	3.8	30.0	6.7
50	25.3	23.5	23.5	26.9	6.4	11.8	27.0	13.9	35.8	22.2	38.0	26.8
70	37.6	31.7	38.9	29.2	24.8	31.0	30.8	29.9	28.5	28.5	22.1	20.7
100	38.2	12.1	27.0	18.4	8.9	17.8	16.3	15.4	31.8	11.9	43.9	20.0
125	40.7	19.1	25.2	16.2	17.2	23.4	9.7	8.5	21.9	10.7	25.4	12.9
150	34.7	15.1	32.7	23.4	27.5	23.5	11.9	12.6	21.5	19.4	21.5	16.8
175	1.5	11.1	7.2	16.5	14.4	16.5	11.9	13.1	23.0	17.1	12.8	14.2
200	28.1	30.7	4.8	19.4	15.7	22.6	23.4	23.0	29.9	27.2	24.1	20.6
225	45.6	45.9	27.0	28.1	36.2	30.8	31.9	29.8	35.4	41.4	36.9	31.9
250	50.5	45.2	33.6	30.0	46.1	34.0	35.7	29.9	39.2	46.0	41.6	38.4
300	49.9	40.9	36.5	32.9	48.6	38.0	40.0	35.6	43.0	48.3	45.8	46.4
350	47.9	39.3	38.1	34.6	48.5	45.5	42.5	45.1	47.6	51.0	51.1	51.2
400	37.9	37.0	34.5	35.0	47.5	47.5	42.5	48.7	49.5	52.8	53.1	54.7
450	25.1	33.3	26.6	32.6	44.0	45.4	41.6	47.1	47.1	47.0	51.4	50.5
500	21.9	30.6	20.3	32.1	38.7	44.0	40.8	44.7	44.0	41.9	49.4	43.3