

	<h1>Operation Change Request</h1>		OCR No: 038 Issue:
Title: Full limb mode orbits for assessing the horizontal gradient effects on profile retrieval			
<p><u>Description of Request:</u></p> <p>To perform a limited number of selected orbits with limb scanning sequences only, (i.e. to replace nadir measurements in between with limb states) in order to increase the horizontal resolution of the limb profiles in flight direction.</p> <p>This allows more correct profile retrievals by accounting for the horizontal gradient effect, i.e. a tomographic retrieval approach can be performed for all latitudes (see Puķīte et al., 2008* where it is studied for the Arctic winter).</p> <p>(1) Of particular interest is to have this “limb-only” mode for few orbits per every month (every second month) in order to estimate this effect for different seasons, since the considered trace gases (O₃, NO₂, BrO, OClO) vary considerably both in latitude and with season. These orbits can be in one day depending on technical possibilities.</p> <p>(2) Besides that, we would ask for “limb-only” orbits during Antarctic polar winter two times (first time: 15 to 25 August, second time 5 to 15 September) for a complete day (in order to assure that for some orbits the measurements will cross the polar vortex boundary where especially strong gradients occur).</p> <p>Common limb retrieval algorithms assume a horizontally homogeneous atmosphere for the retrieval constraint, i.e. the existing strong horizontal gradients of photo chemically active species are neglected. This can lead to remarkable over- or underestimation of the retrieved profiles.</p> <p>An option to account for it is to apply a tomographic approach where radiative transfer modelling is performed by applying an atmosphere that is discretized not only in altitude but also in latitude. It takes into account horizontal gradients using the measurement data from subsequent limb states. This approach is possible when limb states are close enough (i.e. they overlap to some extent) as it was shown in Puķīte et al., (2008) for the northern limb states where no nadir measurements are made in between. By increasing the horizontal resolution of the limb observations in flight direction (i.e. replacing nadir with limb observations for selected orbits) this approach could be applied globally.</p> <p>With this study it is possible to assess the effect of horizontal gradients for the whole orbit for different seasons. The profiles retrieved from the tomographic approach let us then estimate if a 2D retrieval is also possible for the usual SCIAMACHY limb/nadir alternating measurement (e.g. by an interpolation method). This would significantly improve the accuracy of the profiles retrieved from SCIAMACHY limb observations.</p> <p>* Puķīte et al., Atmos. Chem. Phys., 8, 3045-3060, 2008</p>			
Originator: Jānis Puķīte	Date of Issue: 7.8.2008	Signature: e-mail, J. Puķīte, 7.8.2008	
<p><u>Assessment of SSAG (necessary for requests by scientists):</u></p> <p>The tomographic retrieval approach of Jānis Puķīte (MPI Chem, Mainz) is very innovative and may help to retrieve more accurate stratospheric profiles under horizontally heterogeneous stratospheric conditions (vortex etc.). The methods was demonstrated already for high northern latitudes.</p> <p>Before going for a few limb-only days per month on a regular basis, the improvements in limb profiling on a global scale should be demonstrated. It is therefore recommended to investigate and implement first a few limb only orbits to gather relevant test data for a global tomographic retrieval study.</p>			
SSAG: H. Bovensmann, IFE	Date: 16/09/2008	Signature: via e-mail 16/09/2008	
Classification of OCR:			

OCR Analysis (incl. Implementation Option):

This OCR requires to modify timelines only.

The duration of a limb state (55.87 sec) is shorter than that of a nadir state (68.56 sec). Therefore the total number of limb states in a single timeline (N = 63) does not fully cover the illuminated part of the orbit. 63 limb states cover 3519.81 sec while the time span between end of the SO&C window and start of the eclipse phase varies between 3900 sec and 4020 sec. In order not to introduce a data gap of several minutes length we propose to generate two test timelines (set 09, ID 47 and 50). The first with a duration of 3468 sec is complemented by the second with a duration of 451 sec.

Both timelines shall be scheduled for test purposes in 7 consecutive orbits around December 10, 2008. This date has been chosen to avoid conflicts with OCR_036 which also uses test timelines 47 and 50 (different sub IDs) and is expected to be planned for another test run end of November.

SOST: M. Gottwald, DLR-IMF
(ESA, Industry if necessary)

Date: 17/09/2008

Signature: via E-Mail 17/09/2008

Approval of Proposed Implementation:

Originator Approval:
Jānis Pukīte, MPCH

Date: 29/09/2008

Signature: via e-mail 29/09/2008

SSAG Approval:
H. Bovensmann, IFE

Date: 29/09/2008

Signature: via e-mail 29/09/2008

Decision / Approval:

Implementation shall be done for testing during 7 consecutive limb only orbits.

DLR Approval: A. Friker
(if necessary NIVR, SPEC)

Date: 31/10/2008

Signature: via e-mail 31/10/2008

Implementation by SOST:

The 7 *limb only* test orbits are scheduled on December 14, 2008 between orbits 35499 and 35505 (note: around the proposed date on December 10 lunar occultation measurements are planned such that *limb only* timelines cannot be implemented).

The *limb only* portion of the illuminated part of the orbit are covered by two test timelines 47 and 50 (timeline set 09). They execute in total 70 limb states each orbit.

SOST: M. Gottwald, DLR-IMF

Date: 31/10/2008

Signature: via e-mail 31/10/2008

Annex: Test Timelines for OCR_038

H:\scia\Timing\timeline_set_09\tl_09_47_07.xls		SOC_end_ecl_beg_limb_only_part_1		Table start ID =	2945	Event_type =	n/a
DURATION <s>=	3467.87109375	DTX0 <s>=	n/a	DTX1 <s>=	n/a	DTX2 <s>=	n/a
SCHED_TYPE =	NF_FB	GEO_TYPE =	n/a	GEO_NUM <>=	n/a	FOV_CHECK =	NO
RATE_TYPE =	LOW	DTX3 <s>=	n/a	DTX4 <s>=	n/a	TL_PAD <s>=	1.00000000
State Running Index	State ID	State Description	State TT (relative, ct)	State TT (relative, sec)	Start Time (absolute, sec) T1 +	State Duration (sec)	End Time (absolute, sec) T1 +
		T/L setup			0	2.77	
1	29	limb02	709	2.77	55.87	55.87	58.64
2	29	limb02	14303	55.87	58.64	55.87	114.51
3	29	limb02	14303	55.87	114.51	55.87	170.38
4	29	limb02	14303	55.87	170.38	55.87	226.25
5	30	limb03	14303	55.87	226.25	55.87	282.13
6	30	limb03	14303	55.87	282.13	55.87	338.00
7	30	limb03	14303	55.87	338.00	55.87	393.87
8	30	limb03	14303	55.87	393.87	55.87	449.74
9	30	limb03	14303	55.87	449.74	55.87	505.61
10	30	limb03	14303	55.87	505.61	55.87	561.48
11	31	limb04	14303	55.87	561.48	55.87	617.35
12	31	limb04	14303	55.87	617.35	55.87	673.22
13	31	limb04	14303	55.87	673.22	55.87	729.09
14	32	limb05	14303	55.87	729.09	55.87	784.96
15	32	limb05	14303	55.87	784.96	55.87	840.84
16	32	limb05	14303	55.87	840.84	55.87	896.71
17	32	limb05	14303	55.87	896.71	55.87	952.58
18	32	limb05	14303	55.87	952.58	55.87	1008.45
19	32	limb05	14303	55.87	1008.45	55.87	1064.32
20	32	limb05	14303	55.87	1064.32	55.87	1120.19
21	32	limb05	14303	55.87	1120.19	55.87	1176.06
22	32	limb05	14303	55.87	1176.06	55.87	1231.93
23	32	limb05	14303	55.87	1231.93	55.87	1287.80
24	32	limb05	14303	55.87	1287.80	55.87	1343.68
25	32	limb05	14303	55.87	1343.68	55.87	1399.55
26	32	limb05	14303	55.87	1399.55	55.87	1455.42
27	32	limb05	14303	55.87	1455.42	55.87	1511.29
28	32	limb05	14303	55.87	1511.29	55.87	1567.16
29	32	limb05	14303	55.87	1567.16	55.87	1623.03
30	32	limb05	14303	55.87	1623.03	55.87	1678.90
31	32	limb05	14303	55.87	1678.90	55.87	1734.77
32	32	limb05	14303	55.87	1734.77	55.87	1790.64
33	32	limb05	14303	55.87	1790.64	55.87	1846.52
34	32	limb05	14303	55.87	1846.52	55.87	1902.39
35	32	limb05	14303	55.87	1902.39	55.87	1958.26
36	32	limb05	14303	55.87	1958.26	55.87	2014.13
37	32	limb05	14303	55.87	2014.13	55.87	2070.00
38	32	limb05	14303	55.87	2070.00	55.87	2125.87
39	32	limb05	14303	55.87	2125.87	55.87	2181.74
40	32	limb05	14303	55.87	2181.74	55.87	2237.61
41	32	limb05	14303	55.87	2237.61	55.87	2293.48
42	31	limb04	14303	55.87	2293.48	55.87	2349.36
43	31	limb04	14303	55.87	2349.36	55.87	2405.23
44	31	limb04	14303	55.87	2405.23	55.87	2461.10
45	31	limb04	14303	55.87	2461.10	55.87	2516.97
46	30	limb03	14303	55.87	2516.97	55.87	2572.84
47	30	limb03	14303	55.87	2572.84	55.87	2628.71
48	30	limb03	14303	55.87	2628.71	55.87	2684.58
49	33	limb06	14303	55.87	2684.58	55.87	2740.45
50	33	limb06	14303	55.87	2740.45	55.87	2796.32
51	33	limb06	14303	55.87	2796.32	55.87	2852.20
52	33	limb06	14303	55.87	2852.20	55.87	2908.07
53	33	limb06	14303	55.87	2908.07	55.87	2963.94
54	33	limb06	14303	55.87	2963.94	55.87	3019.81
55	33	limb06	14303	55.87	3019.81	55.87	3075.68
56	33	limb06	14303	55.87	3075.68	55.87	3131.55
57	33	limb06	14303	55.87	3131.55	55.87	3187.42
58	33	limb06	14303	55.87	3187.42	55.87	3243.29
59	33	limb06	14303	55.87	3243.29	55.87	3299.16
60	33	limb06	14303	55.87	3299.16	55.87	3355.04
61	33	limb06	14303	55.87	3355.04	55.87	3410.91
62	33	limb06	14303	55.87	3410.91	55.87	3466.78
63	End of Timeline	End of Timeline	14303	55.87			
64	End of Timeline	End of Timeline	0				
		T/L Cleanup	887495		3466.78	0.09	3466.87

Table 1: Timeline 47 (t/l set 09, sub_ID 07)

H:\scia\Timing\timeline_set_09\tl_09_50_06.xls		SOC_end_ecl_beg_limb_only_part_2		Table start ID =	3137	Event_type =	n/a
DURATION <s>=	450,83203125	DTX0 <s>=	n/a	DTX1 <s>=	n/a	DTX2 <s>=	n/a
SCHED_TYPE =	NF_FB	GEO_TYPE =	n/a	GEO_NUM <>=	n/a	FOV_CHECK =	NO
RATE_TYPE =	LOW	DTX3 <s>=	n/a	DTX4 <s>=	n/a	TL_PAD <s>=	1,00000000
State Running Index	State ID	State Description	State TT (relative, sec)	State TT (relative, ct)	Start Time (absolute, sec) T1 +	State Duration (sec)	End Time (absolute, sec) T1 +
		T/L setup			0	2,77	
1	33	limb06	709	2,77		55,87	58,64
2	33	limb06	14303	55,87	58,64	55,87	114,51
3	33	limb06	14303	55,87	114,51	55,87	170,38
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5	33	limb06	14303	55,87	226,25	55,87	282,13
6	33	limb06	14303	55,87	282,13	55,87	338,00
7	33	limb06	14303	55,87	338,00	55,87	393,87
8	33	limb06	14303	55,87	393,87	55,87	449,74
9	End of Timeline	End of Timeline	14303	55,87			
10	End of Timeline	End of Timeline	0				
11	End of Timeline	End of Timeline	0				
12	End of Timeline	End of Timeline	0				
13	End of Timeline	End of Timeline	0				
14	End of Timeline	End of Timeline	0				
15	End of Timeline	End of Timeline	0				
16	End of Timeline	End of Timeline	0				
17	End of Timeline	End of Timeline	0				
18	End of Timeline	End of Timeline	0				
19	End of Timeline	End of Timeline	0				
20	End of Timeline	End of Timeline	0				
21	End of Timeline	End of Timeline	0				
22	End of Timeline	End of Timeline	0				
23	End of Timeline	End of Timeline	0				
24	End of Timeline	End of Timeline	0				
25	End of Timeline	End of Timeline	0				
26	End of Timeline	End of Timeline	0				
27	End of Timeline	End of Timeline	0				
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32	End of Timeline	End of Timeline	0				
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37	End of Timeline	End of Timeline	0				
38	End of Timeline	End of Timeline	0				
39	End of Timeline	End of Timeline	0				
40	End of Timeline	End of Timeline	0				
41	End of Timeline	End of Timeline	0				
42	End of Timeline	End of Timeline	0				
43	End of Timeline	End of Timeline	0				
44	End of Timeline	End of Timeline	0				
45	End of Timeline	End of Timeline	0				
46	End of Timeline	End of Timeline	0				
47	End of Timeline	End of Timeline	0				
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52	End of Timeline	End of Timeline	0				
53	End of Timeline	End of Timeline	0				
54	End of Timeline	End of Timeline	0				
55	End of Timeline	End of Timeline	0				
56	End of Timeline	End of Timeline	0				
57	End of Timeline	End of Timeline	0				
58	End of Timeline	End of Timeline	0				
59	End of Timeline	End of Timeline	0				
60	End of Timeline	End of Timeline	0				
61	End of Timeline	End of Timeline	0				
62	End of Timeline	End of Timeline	0				
63	End of Timeline	End of Timeline	0				
64	End of Timeline	End of Timeline	0				
		T/L Cleanup	115133		449,74	0,09	449,83

Table 2: Timeline 50 (t/l set 09, sub_ID 06)