

ICESat Reference Orbit Ground Tracks

To acquire the necessary 91-day orbit phasing, the NASA ICESat orbit transitioned to the 8-day repeat orbit from 05 August (02:00 UTC) to early September 2004.

The ICESat spacecraft attitude changed by 180 degrees on 30 June 2005. On 08 July 2005, the orbit transitioned to the 8-day repeat cycle to facilitate transition into the desired subcycle of the 91-day orbit in preparation for the Laser 3D fall campaign.

The first several months of ICESat operations were in an orbit that repeated ground tracks every eight days for calibration and validation purposes. During the subsequent mission phase, ICESat has been in an orbit that repeats ground tracks every 91 days. Reference ground track locations are reported at 1 sec intervals, corresponding to an along-track spacing of approximately 7 km.

The actual ICESat orbit is maintained so that the nadir ground track is within ± 1 km of the reference orbit track. Beginning with Laser 2 operations on 25 September 2003 at latitudes north and south of 59 degrees, precise spacecraft attitude control was used to point the laser beam within ± 150 m of the reference orbit ground tracks. Precision spacecraft pointing control is not normally used in mid-latitudes between 59 degrees, so the data tracks at these latitudes typically remain within ± 1 km of the reference orbit ground tracks; however, spacecraft pointing control is used several times a day to target specific off-nadir locations or conduct attitude calibration maneuvers. During those times when pointing at specific targets, the ground tracks depart from the reference orbit tracks by as much as 60 km. Pointing to the reference track north and south of 59 degrees continued through the Laser 3B operations period. Starting with the Laser 3C period, the northern boundary for pointing to the reference track will be moved south to approximately 47° N.

Orbit tracks acquired during the ICESat operation periods are identified in table. During the Laser 1 operation period, the reference tracks were observed on four complete repeat cycles of the 8-day tracks and portions of two repeat cycles. During the Laser 2A operation period, slightly more than one complete cycle of the 8-day orbit was repeated, followed by 45 days in the 91-day repeat orbit. During the Laser 2B operation period and subsequent periods, the reference tracks observed during the last 33 days of Laser 2A operations are being repeated. Acquisition of altimeter channel surface returns along these tracks depends on cloud cover conditions at the time of data collection. The information in the table and the fact that there are approximately 14.8 orbits per day helps determine the day specific tracks were acquired.

Table 1. Reference Orbit Tracks Acquired During ICESat Observation Periods

Operation Period	Start Date	End Date	Starting Track	Ending Track
Laser 1A	2003-02-20	2003-03-21	8-day #72	8-day #24
Laser 1B	2003-03-20	2003-03-29	8-day #25	8-day #23

Operation Period	Start Date	End Date	Starting Track	Ending Track
Laser 2A	2003-09-25	2003-10-04	8-day #88	8-day #100
Laser 2A	2003-10-04	2003-11-19	91-day #1098	91-day #421
Laser 2B	2004-02-17	2004-03-21	91-day #1284	91-day #421
Laser 2C	2004-05-18	2004-06-21	91-day #1283	91-day #434
Laser 3A	2004-10-03	2004-11-08	91-day #1273	91-day #452
Laser 3B	2005-02-17	2005-03-24	91-day #1258	91-day #426
Laser 3C	2005-05-20	2005-06-23	91-day #1275	91-day #421
Laser 3D	2005-10-21	2005-11-24	91-day #1282	91-day #421
Laser 3E	2006-02-22	2006-03-27	91-day #1283	91-day #424
Laser 3F	2006-05-24	2006-06-26	91-day #1283	91-day #420
Laser 3G	2006-10-25	2006-11-27	91-day #1283	91-day #423
Laser 3H	2007-03-12	2007-04-14	91-day #1279	91-day #426
Laser 3I	2007-10-02	2007-11-05	91-day #1280	91-day #421
Laser 3J	2008-02-17	2008-03-21	91-day #1282	91-day #422
Laser 3K	2008-10-04	2008-10-19	91-day #1283	91-day #145
Laser 2D	2008-11-25	2008-12-17	91-day #96	91-day #423
Laser 2E	2009-03-09	2009-04-11	91-day #1286	91-day #424
Laser 2F	2009-09-30	2009-10-11	91-day #1280	91-day #84