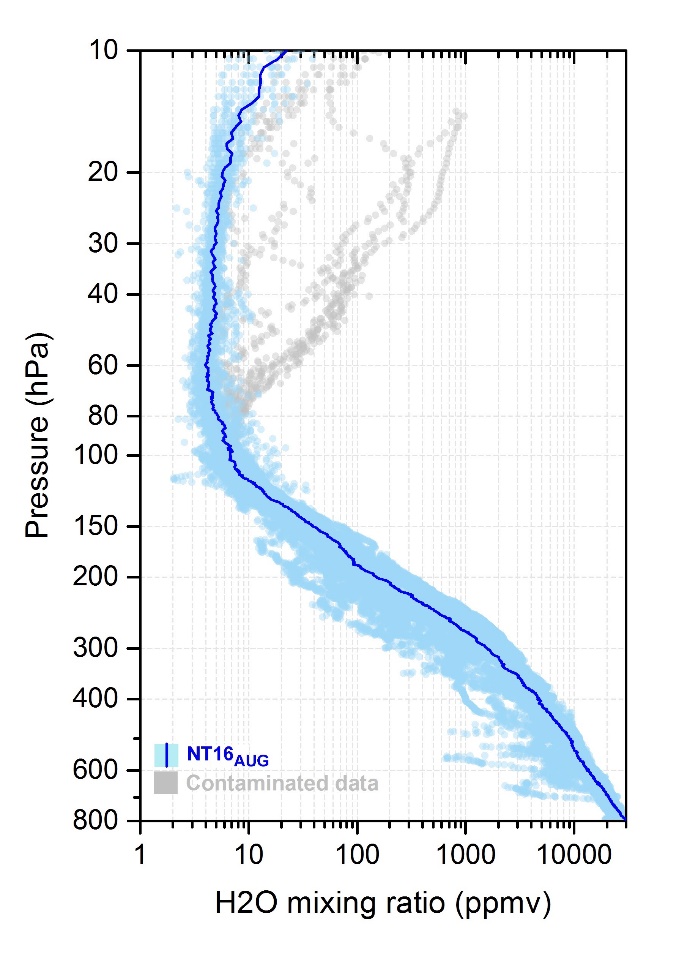
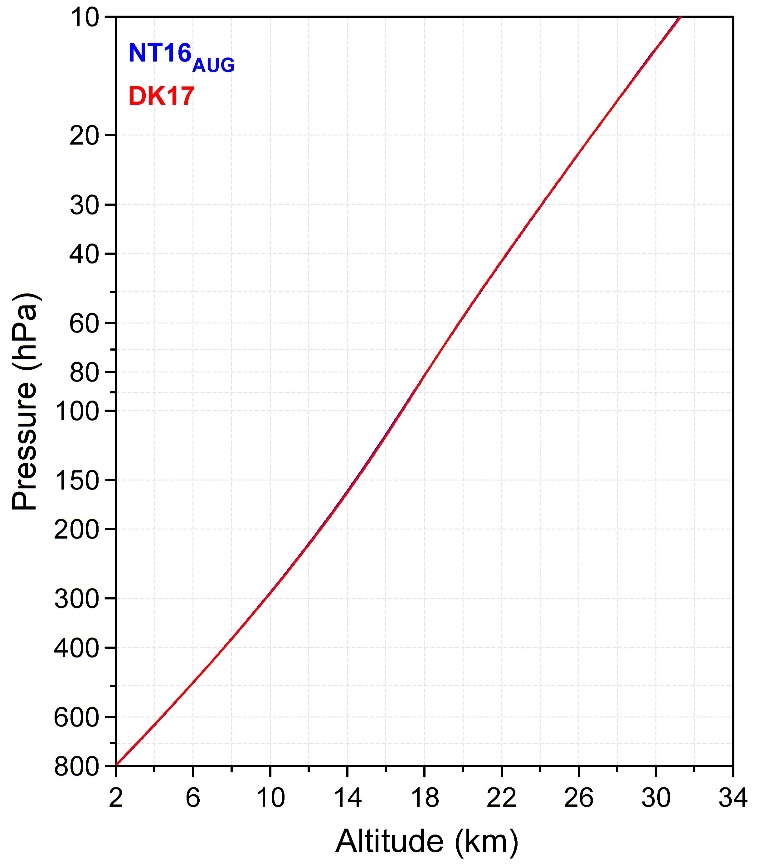
|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sound-ing ID** | **Date** | **Time of launch** | **Radiosonde** | **Payload** | **Status / notes** | **Burst height** |
| NT001 | Aug 02, 2016 | 18:59 UT | iMet-1-RSB | ECC / CFH / COBALD | - | 34.4 km |
| NT002 | Aug 03, 2016 | 15:20 UT | iMet-1-RSB | ECC / CFH / COBALD | - | 29.0 km |
| NT003 | Aug 05, 2016 | 17:23 UT | RS41-SGP / RS92-SGP | ECC / CFH / COBALD | Early burst | 18.6 km |
| NT004 | Aug 06, 2016 | 17:57 UT | RS41-SGP / RS92-SGP | ECC / CFH / COBALD | - | 34.0 km |
| NT005 | Aug 08, 2016 | 16:30 UT | RS41-SGP / RS92-SGP | ECC / CFH / COBALD | - | 30.2 km |
| NT006 | Aug 11, 2016 | 05:04 UT | RS41-SGP / RS92-SGP | ECC / CFH | CFH electronics failure | 32.8 km |
| NT007 | Aug 11, 2016 | 18:57 UT | RS41-SGP / RS92-SGP | ECC / CFH / COBALD | ECC failure, CFH contaminated | 32.5 km |
| NT008 | Aug 12, 2016 | 04:57 UT | RS41-SGP / RS92-SGP | ECC / CFH | - | 32.0 km |
| NT009 | Aug 12, 2016 | 16:20 UT | RS41-SGP / RS92-SGP | ECC / CFH / COBALD | Early burst | 19.8 km |
| NT010 | Aug 15, 2016 | 04:53 UT | RS41-SGP / RS92-SGP | ECC / CFH | CFH contaminated | 29.2 km |
| NT011 | Aug 15, 2016 | 16:53 UT | RS41-SGP / RS92-SGP | ECC / CFH / COBALD | CFH contaminated | 26.7 km |
| NT012 | Aug 16, 2016 | 03:43 UT | RS41-SGP / RS92-SGP | ECC / CFH | - | 31.0 km |
| NT013 | Aug 16, 2016 | 18:27 UT | RS41-SGP / RS92-SGP | ECC / CFH / COBALD | Launch failure (early burst) | 2.7 km |
| NT014 | Aug 17, 2016 | 10:10 UT | RS41-SGP / RS92-SGP | ECC / CFH | - | 33.0 km |
| NT015 | Aug 17, 2016 | 15:30 UT | RS41-SGP / RS92-SGP | ECC / CFH / COBALD | - | 32.7 km |
| NT016 | Aug 18, 2016 | 06:28 UT | RS41-SGP / RS92-SGP | ECC / CFH | - | 29.6 km |
| NT017 | Aug 18, 2016 | 16:04 UT | RS41-SGP / RS92-SGP | ECC / CFH / COBALD | - | 33.9 km |
| NT018 | Aug 19, 2016 | 17:28 UT | RS41-SGP / RS92-SGP | ECC / CFH / COBALD | - | 33.0 km |
| NT019 | Aug 20, 2016 | 03:23 UT | RS41-SGP / RS92-SGP | ECC / CFH | - | 33.4 km |
| NT020 | Aug 20, 2016 | 07:19 UT | RS41-SGP / RS92-SGP | CFH | - | 31.2 km |
| NT021 | Aug 21, 2016 | 03:35 UT | RS41-SGP / RS92-SGP | ECC / CFH | - | 32.3 km |
| NT022 | Aug 21, 2016 | 07:12 UT | RS41-SGP / RS92-SGP | None | Early burst | 18.6 km |
| NT023 | Aug 21, 2016 | 15:51 UT | RS41-SGP / RS92-SGP | ECC / CFH / COBALD | - | 33.0 km |
| NT024 | Aug 22, 2016 | 04:21 UT | RS41-SGP / RS92-SGP | ECC | ECC battery failure | 33.6 km |
| NT025 | Aug 23, 2016 | 16:33 UT | RS41-SGP / RS92-SGP | ECC / CFH / COBALD | - | 32.1 km |
| NT026 | Aug 24, 2016 | 06:03 UT | RS41-SGP / RS92-SGP | ECC / CFH | - | 29.6 km |
| NT027 | Aug 26, 2016 | 18:18 UT | RS41-SGP / RS92-SGP | ECC / CFH / COBALD | - | 33.0 km |
| NT028 | Aug 28, 2016 | 16:11 UT | RS41-SGP / RS92-SGP | ECC / CFH / COBALD | - | 33.9 km |
| NT029 | Aug 30, 2016 | 15:44 UT | RS41-SGP / RS92-SGP | ECC / CFH / COBALD | CFH contaminated | 31.3 km |
| NT030 | Aug 31, 2016 | 05:58 UT | RS41-SGP / RS92-SGP | ECC / CFH | CFH contaminated | 33.0 km |
| NT031 | Nov 08, 2016 | 18:50 UT | RS41-SGP / RS92-SGP | ECC / CFH / COBALD | COBALD battery failure | 32.7 km |
| NT032 | Nov 10, 2016 | 06:56 UT | RS41-SGP / RS92-SGP | ECC / CFH | - | 31.5 km |
| NT033 | Nov 10, 2016 | 14:44 UT | RS41-SGP / RS92-SGP | ECC / CFH / COBALD | - | 32.4 km |
| NT034 | Nov 11, 2016 | 15:37 UT | RS41-SGP / RS92-SGP | ECC / CFH / COBALD | - | 32.1 km |
| NT035 | Nov 12, 2016 | 07:27 UT | RS41-SGP / RS92-SGP | ECC / CFH | CFH contaminated | 30.1 km |
| DK001 | Jul 30, 2017 | 18:27 UT | RS41-SGP / RS92-SGP | ECC / COBALD | - | 34.8 km |
| DK002 | Jul 31, 2017 | 18:40 UT | RS41-SGP / RS92-SGP | ECC / COBALD | - | 25.5 km |
| DK003 | Aug 2, 2017 | 18:48 UT | RS41-SGP / RS92-SGP | ECC | Early burst | 18.0 km |
| DK004 | Aug 3, 2017 | 19:36 UT | RS41-SGP / RS92-SGP | ECC / CFH / COBALD | - | 32.8 km |
| DK005 | Aug 4, 2017 | 18:18 UT | RS41-SGP / RS92-SGP | ECC / CFH | CFH contamin-ated, early burst | 22.7 km |
| DK006 | Aug 5, 2017 | 18:09 UT | RS41-SGP / RS92-SGP | ECC / CFH | ECC failure | 35.0 km |
| DK007 | Aug 6, 2017 | 04:22 UT | RS41-SGP / RS92-SGP | - | - | 33.5 km |
| DK008 | Aug 6, 2017 | 07:40 UT | RS41-SGP / RS92-SGP | - | - | 34.8 km |
| DK009 | Aug 6, 2017 | 18:44 UT | RS41-SGP / RS92-SGP | ECC / CFH | ECC failure CFH contaminated | 27.8 km |
| DK010 | Aug 7, 2017 | 16:45 UT | RS41-SGP / RS92-SGP | ECC / CFH | - | 34.4 km |
| DK011 | Aug 8, 2017 | 04:55 UT | RS41-SGP / RS92-SGP | - | - | 26.9 km |
| DK012 | Aug 8, 2017 | 06:49 UT | RS41-SGP / RS92-SGP | - | - | 33.8 km |
| DK013 | Aug 8, 2017 | 10:20 UT | RS41-SGP / RS92-SGP | ECC / CFH | - | 32.4 km |
| DK014 | Aug 9, 2017 | 03:51 UT | RS41-SGP / RS92-SGP | - | - | 36.9 km |
| DK015 | Aug 9, 2017 | 07:18 UT | RS41-SGP / RS92-SGP | - | - | 35.3 km |
| DK016 | Aug 9, 2017 | 16:49 UT | RS41-SGP / RS92-SGP | ECC / CFH | Early burst | 19.0 km |
| DK017 | Aug 10, 2017 | 03:13 UT | RS41-SGP / RS92-SGP | - | - | 33.6 km |
| DK018 | Aug 10, 2017 | 05:16 UT | RS41-SGP / RS92-SGP | - | - | 35.9 km |
| DK019 | Aug 10, 2017 | 07:33 UT | RS41-SGP / RS92-SGP | - | - | 36.5 km |
| DK020 | Aug 10, 2017 | 16:29 UT | RS41-SGP / RS92-SGP | ECC / CFH | Early burst | 18.0 km |
| DK021 | Aug 11, 2017 | 02:51 UT | RS41-SGP / RS92-SGP | - | - | 35.6 km |
| DK022 | Aug 11, 2017 | 05:30 UT | RS41-SGP / RS92-SGP | - | - | 32.5 km |
| DK023 | Aug 11, 2017 | 07:37 UT | RS41-SGP / RS92-SGP | - | - | 33.2 km |
| DK024 | Aug 11, 2017 | 11:51 UT | RS41-SGP / RS92-SGP | ECC / CFH | - | 33.5 km |
| DK025 | Aug 12, 2017 | 05:44 UT | RS41-SGP / RS92-SGP | - | Telemetry issues, sounding term-inated manually | Un-known |
| DK026 | Aug 12, 2017 | 08:18 UT | RS41-SGP / RS92-SGP | - | - | 26.8 km |
| DK027 | Aug 12, 2017 | 11:36 UT | RS41-SGP / RS92-SGP | CFH | CFH contaminated | 31.8 km |
| DK028 | Aug 12, 2017 | 16:53 UT | RS41-SGP | CFH | Early burst, CFH contaminated | 22.3 km |

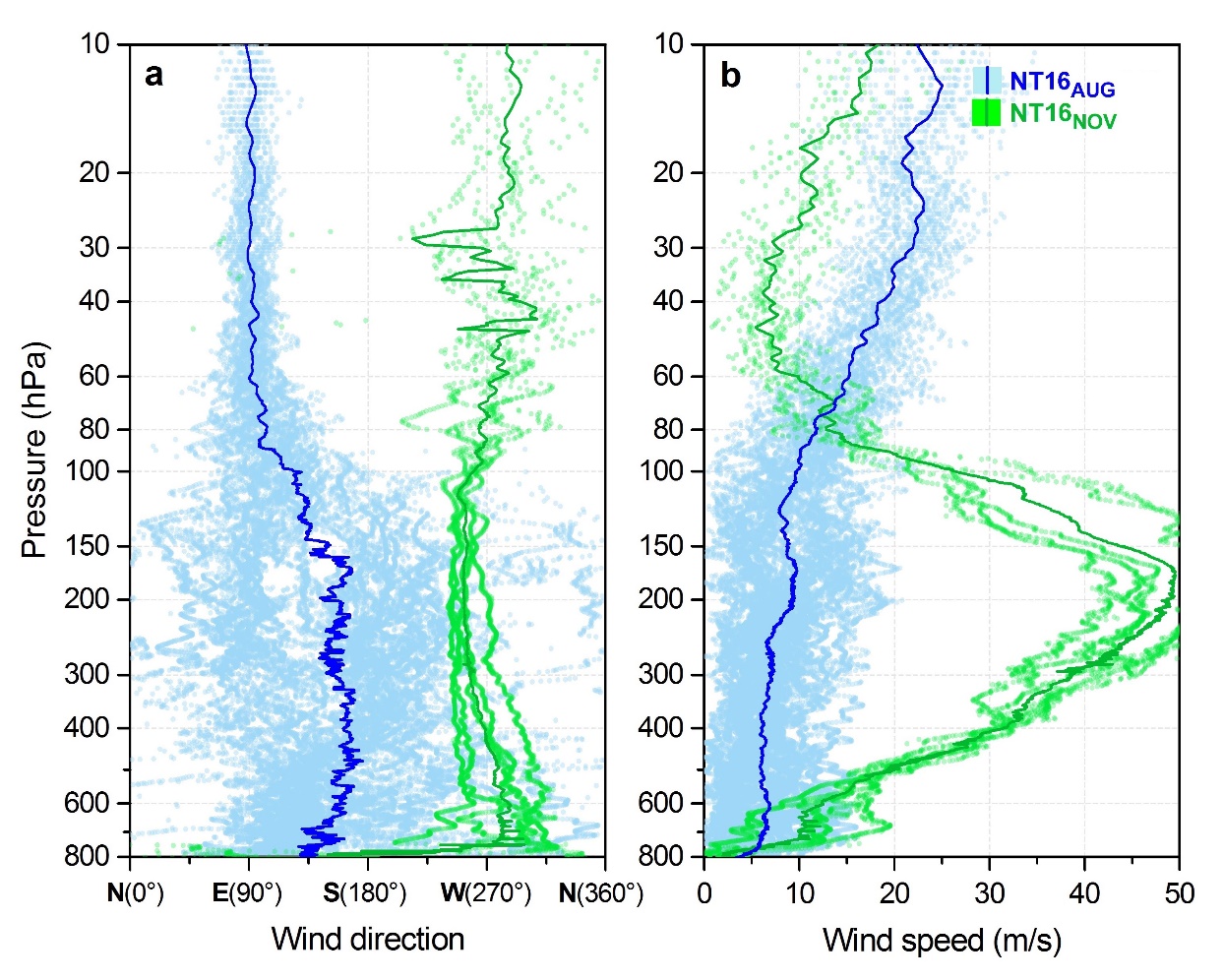
**Table S1. List of all balloon soundings performed, including sounding identifier (ID), date and time of launch, radiosondes and payload used, status / notes (instrumental malfunctionings), and burst altitude. The sounding ID is composed of the station abbreviation (NT for Nainital, India; DK for Dhulikhel, Nepal) and sounding chronological number. Exact coordinates (latitude, longitude) of the sounding stations were, in NT: 29.3554°N, 79.4619°E; in DK: 27.6193°N, 85.5386°E.**



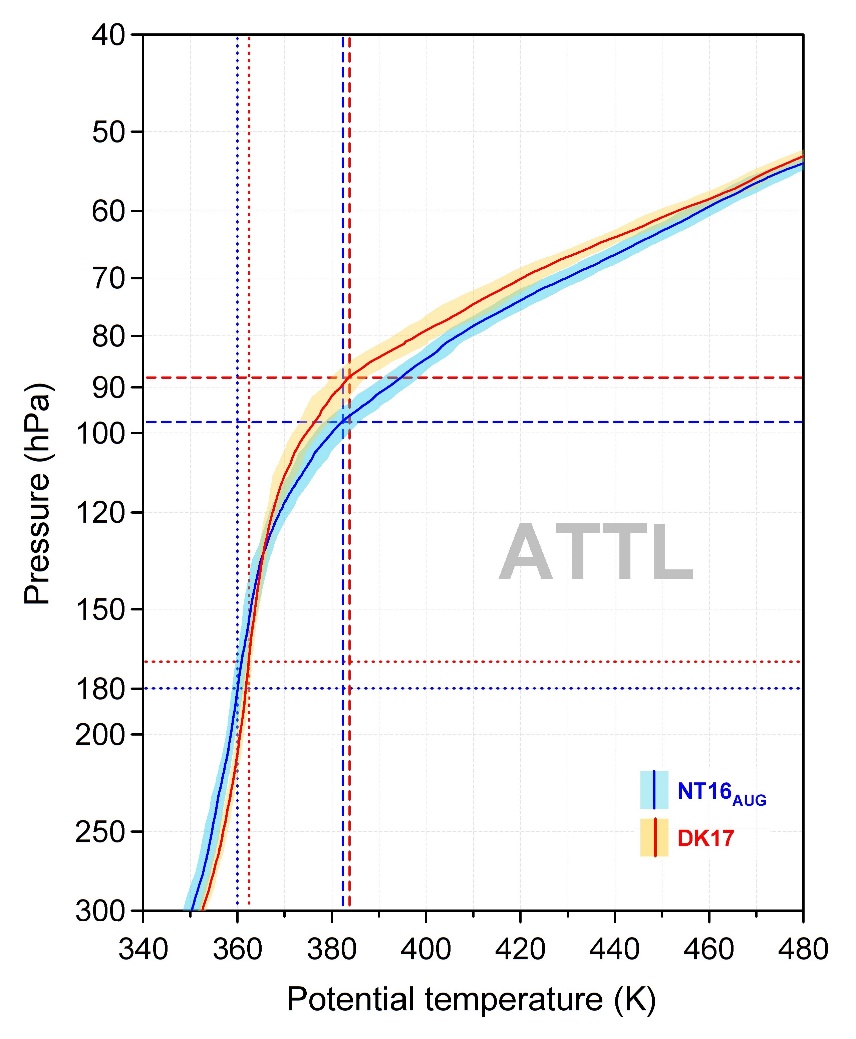
**Figure S1. All measurements of H2O mixing ratio by CFH of the NT16AUG campaign. Blue dots: data points used for the analysis. Grey dots: measurements showing CFH contamination (as described in Section 2). Blue solid line: mean profile of the data points used for the analysis. Contaminated measurements are detected using a threshold of 10 ppmv in the stratosphere, and the onset of contamination is inferred as the lowest altitude where the measurement deviates significantly from the mean profile. Increased H2O mixing ratio in all measurements above 20 hPa is likely due to outgassing from the balloon skin and the payload train (discussed in Section 3.3).**



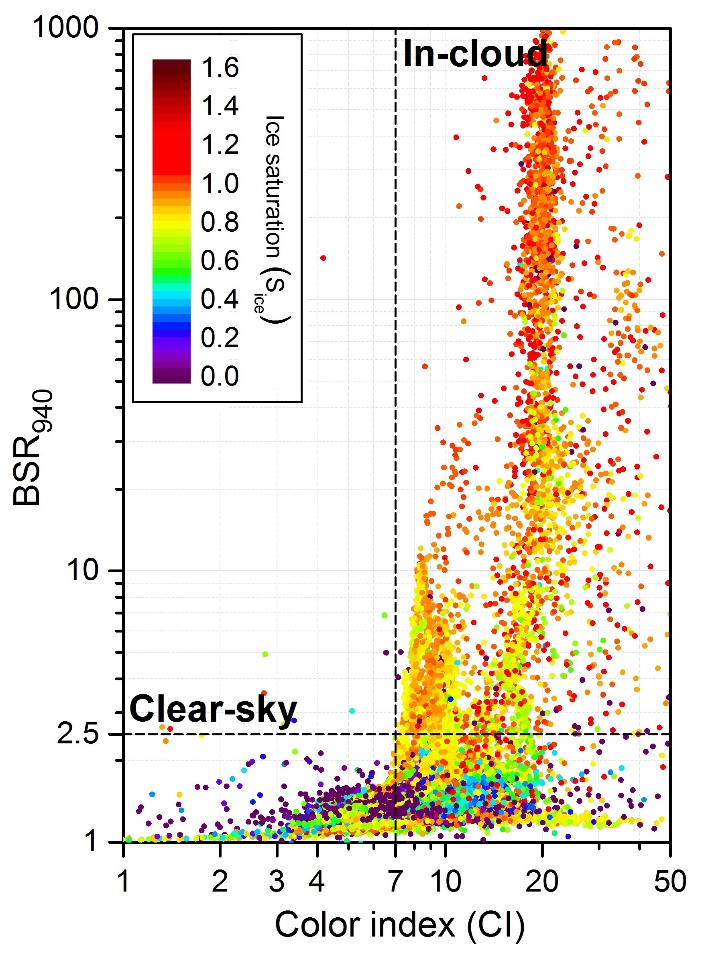
**Figure S2. Mean profiles of altitude as a function of pressure from RS41-SGP measurements of the NT16AUG (blue) and DK17 (red) campaigns.**



**Figure S3. All measurements (dots) and mean profiles (solid lines) of wind direction (Panel a) and wind speed (b) as a function of pressure, measured by RS41-SGP during the NT16AUG (blue) and NT16NOV (green) campaigns.**

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**Figure S4. Mean profiles (solid lines) and standard deviations (color shading) of potential temperature as a function of pressure, for NT16AUG (blue) and DK17 (red). Horizontal lines show the mean CPT (dashed) and LRM (dotted) for NT16 (blue), and DK17 (red). The ATTL region (between the LRM and CPT) is highlighted by a grey label.**



**Figure S5. All measurements of the NT16AUG campaign (dots), shown as a scatter plot of BSR at 940 nm (BSR940) as a function of color index (CI), color-coded with ice saturation (Sice). Dashed lines show the BSR940 = 2.5 and CI = 7 isolines, which are the optical thresholds used for cloud-filtering (discussed in Section 6.2).**