

Supplement of Atmos. Meas. Tech., 9, 1063–1082, 2016  
<http://www.atmos-meas-tech.net/9/1063/2016/>  
doi:10.5194/amt-9-1063-2016-supplement  
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*Supplement of*

**New temperature and pressure retrieval algorithm for high-resolution infrared solar occultation spectroscopy: analysis and validation against ACE-FTS and COSMIC**

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This supplementary information contains a list of ACE-FTS occultations used in our analysis and compared to ACE-FTS v3.5 and COSMIC data products. The list is organized into sets as in the article. ACE-FTS IDs indicate whether the occultation was at sunset, measured from the top of the atmosphere downward and marked *ss*, or at sunrise, marked *sr*, and are sequentially numbered since the start of operation. COSMIC IDs are in the form  $C_{jjj}.YYYY.DDD.HH.MM.G_{ii}$  where *jjj* and *ii* are the indices of the COSMIC and GPS satellites, and  $YYYY.DDD.HH.MM$  are the year, ordinal date, hour and minute of the occultation. Latitude, longitude, and  $\beta$  angle are of the ACE-FTS vertical profiles at the 30 km tangent altitude. Mean  $z$  spacings are calculated from the retrieved ACE-FTS tangent altitudes between 20 and 100 km.

Table 1. Middle East

| ACE ID  | Date           | Latitude | Longitude | $\beta$ angle | $\bar{z}$ spacing |
|---------|----------------|----------|-----------|---------------|-------------------|
| ss5195  | 30 July 2004   | 34.99°   | 85.36°    | -34.1°        | 4.5 km            |
| ss5211  | 31 July 2004   | 31.37°   | 52.37°    | -36.7°        | 4.4 km            |
| ss5225  | 01 August 2004 | 27.96°   | 68.53°    | -39.0°        | 4.0 km            |
| sr5616  | 28 August 2004 | 29.62°   | 50.29°    | -44.3°        | 3.7 km            |
| sr10063 | 25 June 2005   | -37.59°  | 161.36°   | 62.0°         | 1.5 km            |
| ss10081 | 27 June 2005   | 31.88°   | 51.38°    | 58.7°         | 2.1 km            |
| ss10604 | 01 August 2005 | 32.03°   | 85.72°    | -36.4°        | 4.2 km            |
| ss10605 | 01 August 2005 | 31.80°   | 61.16°    | -36.6°        | 4.6 km            |
| ss10619 | 02 August 2005 | 28.39°   | 77.37°    | -38.8°        | 4.0 km            |
| ss10620 | 02 August 2005 | 28.14°   | 52.82°    | -39.0°        | 4.2 km            |
| sr11009 | 29 August 2005 | 29.07°   | 84.88°    | -44.9°        | 3.7 km            |
| sr11010 | 29 August 2005 | 29.38°   | 60.38°    | -44.7°        | 3.7 km            |
| sr11024 | 30 August 2005 | 33.42°   | 77.42°    | -42.6°        | 3.9 km            |
| sr11025 | 30 August 2005 | 33.70°   | 52.93°    | -42.5°        | 3.9 km            |
| sr15160 | 06 June 2006   | 31.28°   | 63.32°    | 59.2°         | 2.0 km            |
| ss15999 | 02 August 2006 | 32.02°   | 81.99°    | -36.5°        | 4.6 km            |
| ss16000 | 02 August 2006 | 31.78°   | 57.43°    | -36.7°        | 4.3 km            |
| ss16015 | 03 August 2006 | 28.11°   | 49.12°    | -39.1°        | 4.1 km            |
| ss21394 | 03 August 2007 | 32.10°   | 85.20°    | -36.6°        | 4.3 km            |
| ss26790 | 03 August 2008 | 32.05°   | 68.94°    | -36.9°        | 4.2 km            |
| ss26804 | 04 August 2008 | 28.64°   | 85.23°    | -39.2°        | 4.1 km            |
| ss26805 | 04 August 2008 | 28.39°   | 60.68°    | -39.3°        | 4.1 km            |
| sr27195 | 31 August 2008 | 29.21°   | 70.17°    | -45.3°        | 3.7 km            |
| sr27209 | 31 August 2008 | 33.33°   | 87.33°    | -43.2°        | 3.8 km            |

Table 2. Arctic 2010

| ACE ID  | Date             | Latitude | Longitude | $\beta$ angle | $\bar{z}$ spacing |
|---------|------------------|----------|-----------|---------------|-------------------|
| ss35483 | 16 March 2010    | 77.91°   | 169.09°   | 10.0°         | 5.8 km            |
| ss35533 | 19 March 2010    | 74.48°   | 34.38°    | 1.0°          | 5.8 km            |
| ss35542 | 20 March 2010    | 73.76°   | 175.41°   | -0.6°         | 5.9 km            |
| sr36477 | 22 May 2010      | 67.81°   | 139.78°   | 10.1°         | 5.8 km            |
| sr36539 | 26 May 2010      | 68.76°   | 39.31°    | 21.7°         | 5.3 km            |
| sr36540 | 26 May 2010      | 68.74°   | 14.44°    | 21.9°         | 5.3 km            |
| sr36550 | 27 May 2010      | 68.48°   | 125.74°   | 23.7°         | 10.8 km           |
| sr36554 | 27 May 2010      | 68.34°   | 26.26°    | 24.5°         | 5.3 km            |
| sr36563 | 28 May 2010      | 67.96°   | 162.45°   | 26.2°         | 5.1 km            |
| sr36598 | 30 May 2010      | 65.44°   | 12.85°    | 32.8°         | 4.7 km            |
| sr36603 | 31 May 2010      | 64.95°   | -111.25°  | 33.7°         | 4.9 km            |
| sr36605 | 31 May 2010      | 64.74°   | -160.89°  | 34.1°         | 4.7 km            |
| ss37209 | 11 July 2010     | 66.37°   | -100.83°  | 29.8°         | 4.8 km            |
| ss37218 | 11 July 2010     | 66.97°   | 35.58°    | 28.3°         | 6.8 km            |
| ss37238 | 13 July 2010     | 67.92°   | -101.52°  | 24.4°         | 5.1 km            |
| ss37268 | 15 July 2010     | 68.44°   | -127.32°  | 18.8°         | 5.5 km            |
| ss37280 | 16 July 2010     | 68.36°   | -65.52°   | 16.5°         | 5.5 km            |
| ss37300 | 17 July 2010     | 67.90°   | 157.80°   | 12.8°         | 5.6 km            |
| ss37304 | 17 July 2010     | 67.76°   | 58.52°    | 12.1°         | 5.8 km            |
| ss37332 | 19 July 2010     | 66.42°   | 84.33°    | 6.9°          | 5.8 km            |
| ss37336 | 19 July 2010     | 66.17°   | -14.73°   | 6.1°          | 5.8 km            |
| ss38791 | 26 October 2010  | 69.95°   | -2.61°    | 57.7°         | 2.2 km            |
| ss39009 | 10 November 2010 | 67.17°   | 63.81°    | 23.3°         | 5.2 km            |
| ss39045 | 12 November 2010 | 66.42°   | -95.56°   | 16.7°         | 5.6 km            |
| ss39129 | 18 November 2010 | 64.59°   | 13.39°    | 1.0°          | 5.8 km            |
| ss39144 | 19 November 2010 | 64.24°   | 7.27°     | -1.8°         | 5.8 km            |
| ss39159 | 20 November 2010 | 63.89°   | 1.19°     | -4.6°         | 5.8 km            |
| ss39160 | 20 November 2010 | 63.86°   | -23.21°   | -4.8°         | 5.9 km            |
| ss39191 | 22 November 2010 | 63.08°   | -59.59°   | -10.7°        | 5.7 km            |
| ss39204 | 23 November 2010 | 62.74°   | -16.71°   | -13.2°        | 5.6 km            |

Table 3. Arctic Fall

| ACE ID  | Date              | Latitude | Longitude | $\beta$ angle | $\bar{z}$ spacing | COSMIC ID               |
|---------|-------------------|----------|-----------|---------------|-------------------|-------------------------|
| sr32864 | 19 September 2009 | 74.57°   | -132.61°  | 1.3°          | 5.8 km            | C003.2009.262.14.38.G08 |
| ss33549 | 05 November 2009  | 68.78°   | -166.00°  | 35.0°         | 4.5 km            | C002.2009.309.01.14.G13 |
| ss33562 | 05 November 2009  | 68.51°   | -123.72°  | 32.7°         | 4.7 km            | C006.2009.309.23.25.G07 |
| ss33580 | 07 November 2009  | 68.15°   | 156.39°   | 29.5°         | 4.9 km            | C002.2009.311.05.12.G03 |
| ss33603 | 08 November 2009  | 67.66°   | -45.58°   | 25.4°         | 5.5 km            | C002.2009.312.16.43.G15 |
| ss33617 | 09 November 2009  | 67.36°   | -27.61°   | 22.9°         | 5.3 km            | C002.2009.313.16.18.G15 |
| ss33643 | 11 November 2009  | 66.80°   | 57.28°    | 18.1°         | 5.5 km            | C005.2009.315.11.33.G15 |
| ss33665 | 12 November 2009  | 66.31°   | -120.04°  | 14.1°         | 5.7 km            | C002.2009.316.21.41.G16 |
| ss33810 | 22 November 2009  | 62.79°   | -59.25°   | -13.2°        | 5.7 km            | C005.2009.326.18.40.G14 |
| ss33827 | 23 November 2009  | 62.30°   | -113.88°  | -16.5°        | 5.6 km            | C002.2009.327.21.49.G25 |
| ss33841 | 24 November 2009  | 61.87°   | -95.27°   | -19.2°        | 5.4 km            | C003.2009.328.22.03.G23 |
| sr38467 | 04 October 2010   | 84.27°   | -100.62°  | 37.7°         | 4.4 km            | C001.2010.277.15.59.G27 |
| sr38524 | 08 October 2010   | 83.70°   | -33.09°   | 46.9°         | 3.5 km            | C001.2010.281.12.19.G25 |
| sr38634 | 15 October 2010   | 80.61°   | 157.33°   | 60.6°         | 1.6 km            | C001.2010.289.00.32.G02 |
| ss39000 | 09 November 2010  | 67.35°   | -76.30°   | 24.9°         | 5.2 km            | C002.2010.313.20.26.G17 |
| ss39225 | 25 November 2010  | 62.15°   | -168.89°  | -17.2°        | 5.6 km            | C001.2010.329.02.33.G20 |

**Table 4.** Arctic Winter

| ACE ID  | Date             | Latitude | Longitude | $\beta$ angle | $\bar{z}$ spacing | COSMIC ID               |
|---------|------------------|----------|-----------|---------------|-------------------|-------------------------|
| sr29131 | 09 January 2009  | 60.13°   | -0.32°    | -26.9°        | 5.1 km            | C003.2009.009.10.05.G10 |
| sr29551 | 06 February 2009 | 67.05°   | -180.87°  | 48.7°         | 3.3 km            | C001.2009.037.21.28.G11 |
| ss29702 | 17 February 2009 | 61.45°   | -149.60°  | 61.8°         | 1.4 km            | C005.2009.048.01.46.G13 |
| sr34446 | 04 January 2010  | 56.35°   | 160.98°   | -42.1°        | 3.9 km            | C001.2010.004.22.13.G11 |
| sr34474 | 06 January 2010  | 58.04°   | -160.15°  | -36.7°        | 8.8 km            | C003.2010.006.20.23.G15 |
| sr34538 | 11 January 2010  | 60.65°   | 81.09°    | -24.5°        | 5.2 km            | C003.2010.011.04.37.G24 |
| sr34581 | 14 January 2010  | 61.88°   | 112.73°   | -16.2°        | 5.6 km            | C001.2010.014.00.59.G04 |
| sr34668 | 19 January 2010  | 63.81°   | 149.83°   | 0.3°          | 5.8 km            | C003.2010.019.23.49.G06 |
| sr34706 | 22 January 2010  | 64.52°   | -58.01°   | 7.4°          | 9.7 km            | C001.2010.022.12.36.G04 |
| sr34708 | 22 January 2010  | 64.55°   | -106.86°  | 7.8°          | 5.7 km            | C001.2010.022.15.57.G24 |
| ss35082 | 17 February 2010 | 55.70°   | -124.01°  | 61.9°         | 1.4 km            | C002.2010.048.01.43.G17 |
| ss35139 | 20 February 2010 | 73.71°   | -99.45°   | 61.0°         | 1.6 km            | C002.2010.051.21.57.G12 |
| ss35196 | 24 February 2010 | 79.06°   | -69.61°   | 56.1°         | 2.4 km            | C005.2010.055.18.25.G22 |
| sr39838 | 05 January 2011  | 56.28°   | -106.75°  | -42.5°        | 3.9 km            | C001.2011.005.16.07.G09 |
| sr39912 | 10 January 2011  | 60.02°   | -107.91°  | -28.3°        | 4.9 km            | C001.2011.010.15.35.G09 |
| sr39976 | 15 January 2011  | 61.98°   | 132.04°   | -16.1°        | 5.5 km            | C001.2011.014.23.54.G08 |
| sr40020 | 18 January 2011  | 63.03°   | 138.69°   | -7.7°         | 5.7 km            | C004.2011.017.23.35.G08 |
| sr40139 | 26 January 2011  | 65.37°   | 113.41°   | 14.6°         | 5.4 km            | C004.2011.026.02.34.G32 |
| sr40193 | 29 January 2011  | 66.30°   | -125.91°  | 24.5°         | 5.2 km            | C001.2011.029.17.15.G31 |
| ss40535 | 21 February 2011 | 75.14°   | -107.45°  | 61.1°         | 1.7 km            | C006.2011.052.23.09.G22 |
| ss40550 | 22 February 2011 | 77.01°   | -120.28°  | 60.1°         | 1.7 km            | C002.2011.053.22.05.G28 |
| sr45403 | 18 January 2012  | 62.85°   | 104.51°   | -9.8°         | 5.6 km            | C006.2012.018.03.22.G30 |
| sr45449 | 21 January 2012  | 63.88°   | 62.23°    | -1.0°         | 5.7 km            | C006.2012.021.05.23.G13 |

Table 5. Antarctic Spring

| ACE ID  | Date          | Latitude | Longitude | $\beta$ angle | $\bar{z}$ spacing | COSMIC ID               |
|---------|---------------|----------|-----------|---------------|-------------------|-------------------------|
| sr30341 | 01 April 2009 | -83.50°  | -40.38°   | -35.0°        | 4.5 km            | C001.2009.091.11.22.G22 |
| sr30350 | 02 April 2009 | -83.53°  | 103.16°   | -36.5°        | 4.5 km            | C004.2009.092.02.09.G12 |
| sr30475 | 10 April 2009 | -81.47°  | -47.62°   | -55.1°        | 2.6 km            | C004.2009.100.13.45.G12 |
| sr30480 | 10 April 2009 | -81.32°  | -170.19°  | -55.7°        | 2.9 km            | C004.2009.100.22.10.G28 |
| ss30628 | 20 April 2009 | -65.39°  | -103.32°  | -61.7°        | 1.7 km            | C005.2009.110.23.40.G07 |
| ss30664 | 23 April 2009 | -68.41°  | 89.73°    | -59.0°        | 2.0 km            | C005.2009.113.10.34.G25 |
| ss30721 | 27 April 2009 | -69.37°  | 130.73°   | -52.4°        | 2.9 km            | C002.2009.117.07.22.G03 |
| ss30739 | 28 April 2009 | -69.31°  | 49.76°    | -49.9°        | 3.2 km            | C002.2009.118.11.43.G06 |
| ss30754 | 29 April 2009 | -69.19°  | 42.48°    | -47.7°        | 3.4 km            | C004.2009.119.12.06.G18 |
| ss30775 | 30 April 2009 | -68.96°  | -111.49°  | -44.5°        | 3.7 km            | C006.2009.120.21.27.G28 |
| ss30814 | 03 May 2009   | -68.41°  | 14.51°    | -38.1°        | 4.3 km            | C005.2009.123.14.17.G23 |
| ss30819 | 03 May 2009   | -68.33°  | -107.76°  | -37.3°        | 4.4 km            | C005.2009.123.22.42.G14 |
| ss30871 | 07 May 2009   | -67.43°  | 61.02°    | -28.4°        | 5.0 km            | C006.2009.127.11.37.G18 |
| ss30945 | 12 May 2009   | -66.03°  | 52.92°    | -15.2°        | 5.6 km            | C006.2009.132.11.04.G18 |
| ss31095 | 22 May 2009   | -62.72°  | -9.07°    | 12.5°         | 5.7 km            | C005.2009.142.16.12.G16 |
| ss31120 | 24 May 2009   | -62.04°  | 101.09°   | 17.2°         | 5.6 km            | C002.2009.144.08.46.G27 |
| sr35416 | 11 March 2010 | -60.44°  | 179.20°   | 21.9°         | 5.4 km            | C003.2010.070.17.18.G04 |
| sr35691 | 30 March 2010 | -82.42°  | -22.81°   | -27.2°        | 5.1 km            | C004.2010.089.09.46.G28 |
| sr35774 | 05 April 2010 | -82.93°  | 137.05°   | -41.1°        | 4.1 km            | C002.2010.095.01.30.G15 |
| sr35787 | 05 April 2010 | -82.78°  | -177.30°  | -43.2°        | 3.9 km            | C001.2010.095.22.50.G27 |
| sr35775 | 05 April 2010 | -82.92°  | 112.89°   | -41.3°        | 4.5 km            | C001.2010.095.02.38.G31 |
| sr35830 | 08 April 2010 | -81.99°  | -140.91°  | -49.7°        | 5.2 km            | C002.2010.098.20.21.G23 |
| sr35840 | 09 April 2010 | -81.76°  | -24.57°   | -51.1°        | 3.1 km            | C002.2010.099.13.10.G15 |
| ss36233 | 06 May 2010   | -67.71°  | 162.96°   | -34.0°        | 4.6 km            | C006.2010.126.03.19.G20 |
| ss36308 | 11 May 2010   | -66.44°  | 129.86°   | -20.8°        | 5.4 km            | C005.2010.131.05.25.G03 |
| ss36442 | 20 May 2010   | -63.76°  | 97.47°    | 3.7°          | 5.9 km            | C002.2010.140.08.21.G09 |
| ss36472 | 22 May 2010   | -63.06°  | 85.35°    | 9.3°          | 5.8 km            | C005.2010.142.08.56.G15 |
| ss36613 | 31 May 2010   | -58.23°  | -111.78°  | 35.7°         | 4.8 km            | C005.2010.151.21.44.G22 |
| ss41959 | 29 May 2011   | -60.25°  | 24.35°    | 26.6°         | 5.9 km            | C001.2011.149.14.13.G16 |

Table 6. Low-Latitudes

| ACE ID  | Date             | Latitude | Longitude | $\beta$ angle | $\bar{z}$ spacing | COSMIC ID               |
|---------|------------------|----------|-----------|---------------|-------------------|-------------------------|
| sr30660 | 23 April 2009    | -27.84°  | 43.90°    | -59.4°        | 1.9 km            | C004.2009.113.04.19.G18 |
| sr30733 | 28 April 2009    | 7.35°    | 50.15°    | -50.7°        | 3.0 km            | C006.2009.118.01.37.G16 |
| ss34863 | 02 February 2010 | -34.24°  | -164.73°  | 35.8°         | 4.4 km            | C004.2010.033.06.04.G02 |
| ss35008 | 12 February 2010 | 16.26°   | -100.09°  | 56.8°         | 2.3 km            | C004.2010.043.01.12.G18 |
| ss38637 | 16 October 2010  | 22.36°   | -164.09°  | 60.8°         | 1.7 km            | C006.2010.289.05.09.G31 |
| sr38918 | 04 November 2010 | -30.94°  | -24.04°   | 39.2°         | 4.2 km            | C002.2010.308.06.54.G09 |
| ss42994 | 07 August 2011   | 27.12°   | 15.62°    | -40.5°        | 4.1 km            | C006.2011.219.18.33.G31 |