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--------------------- GOME HCHO data set ------------------------------
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This document describes the preparation of the GOME HCHO slant column
2.5 x 2.0 deg (lonxlat) gridded product.

All data is contained within the file:

GOME_HCHO_SCD_GRIDDED_2.5x2.0.tar.gz

which can be decompressed using the following command:

>> tar -xvzf GOME_HCHO_SCD_GRIDDED_2.5x2.0.tar.gz

Product generation:

1) A mask is generated to select the remote marine background. This
   includes the remote Pacific, the Southern Oceans and the Arctic
   Seas (east, and including part, of Greenland).

   The mask is in the file:

   lg_MARINE_BCKGROUND_MASK_27_Nov_2006.txt

   Data Format = 144 (longitude) columns by 91 (latitude) rows

   This mask is plotted in the file: Marine_Mask_27_Nov_2006.png

2) The solar and diffuser plate correction is then calculated by
   gridding the slant columns, for each respective forward scan, onto
   the GEOS-CHEM 2.5x2.0 degree grid.

   The GOME data (available on request) that has been used for this
   calculation have been processed with the GOMECAT cloud information,
   see:

   Kurosu et al., 1999, "CRAG—Cloud retrieval algorithm for the
   European Space Agency's Global Ozone Monitoring Experiment", in
   Proceedings of the European Symposium of Atmospheric Measurements
   from Space (ESAMS), pp. 513 – 521, European Space Agency, Noordwijk,
   Netherlands.

   These files have the extension: *.gomecat and have a format:

       Columns:
       1) Pixel #
       2) Scan # (0-3; 3 is backscan and is not used)
       3) Slant Column [molec cm-2]
       4) Slant Column Fitting Uncertainty [molec cm-2]
       5) Fitting RMS
       6) Geometric Air Mass Factor
       7) Geometric Vertical Column [molec cm-2]
       8) Geometric Vertical Column Uncertainty [molec cm-2]
       9) Solar Zenith Angle [deg]
       10) Line-of-Sight Solar Zenith Angle [deg]
       11) - 18) Latitude and Longitude of Pixel Corners [deg]
       19) Latitude of Pixel Center [deg]
       20) Longitude of Pixel Center [deg]
       21) PMD Cloud Fraction
       22) Oxygen A-band Cloud Fraction <<<< Cloud fraction used!!!!!
       23) Cloud Top Height [m]
       24) Cloud Top Pressure [hPa]
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25) Cloud Optical Thickness


    The mask is then applied to the gridded data and the zonal average
    (i.e. the diffuser plate correction, denoted DPC) for each latitude
    is then calculated.

    Bad solar days and anomalous jumps in the HCHO data are also excluded,
    see "Quantifying the seasonal and interannual variablity of North
    American isoprene emissions using satellite observations of the
    formaldehyde column" by Palmer et al., JGR, 2006 for further
    information.

    The mask is also applied to a HCHO model background to calculate
    a model zonal mean (MODEL) for each latitude.

    This DPC data is available on request. The filename format is:

    mmm.XXXX.GOL_mpb.dat

    mmm  = month e.g. 'jan', 'feb',...
    XXXX = year  e.g. '1996' , '1997',...

    Each file contains blocks of data consisting of 4 lines of data
    followed by a list of GOME files, which require the extension
    '.gomecat', to which the data can ONLY be applied!

    For, example:

    0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.531E+15  0.555E+15  ...
    0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.142E+17  0.146E+17  ...
    0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.894E+16  0.112E+17  ...
    0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.772E+16  0.894E+16  ...
    1998/jul1998/GOME-1998-jul-02-115.hcho
    1998/jul1998/GOME-1998-jul-02-133.hcho
    1998/jul1998/GOME-1998-jul-02-151.hcho
    1998/jul1998/GOME-1998-jul-02-165.hcho
    1998/jul1998/GOME-1998-jul-02-183.hcho
    ......
    ...

    Each line of data has of 91 latitude values.
    Line 1 = MODEL data
    Line 2 = DPC Zonal mean of gridded GOME data for SCAN=0
    Line 3 = DPC Zonal mean of gridded GOME data for SCAN=1
    Line 4 = DPC Zonal mean of gridded GOME data for SCAN=2


3) The solar and diffuser place correction (DPC) is then applied to the
   HCHO slant column (SCD) via the formula:

   SCD[latitude, scan] =
        SCD[latitude, scan] - ( DPC[latitude,scan] - MODEL[latitude])

   The corrected slant columns, which excludes observations above 70N
   and GOME pixels which have a cloud fraction >40.0, are re-written
   to output files of name: *.hcho.gomecat.dpc

   e.g. GOME-1998-jul-02-115.hcho.gomecat.dpc

   These files have the same format as the *.gomecat data except with the
   addition of two extra columns:

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    26) DPC flag:
        = 0 if correction not applied
        = 1 if correction applied
    27) New 'corrected' slant column density [molec cm-2].
        Note, if the correction cannot be applied, i.e. DPC flag = 0,
        then the original slant column value is inserted.

    This data is also available on request.

4) The DPC corrected slant columns are then re-gridded to the GE0S-CHEM
   grid using columns which meet with the following citeria:

    a) cloud fraction < 40% (by default)
    b) (slant column error / new slant column ) > -3.0
    c) slant column < 1.0e18 molecules/cm2
    d) pixel centre latitude < 70S
    e) DPC flag = 1.0

    These files are:

    jan1996.gd.dpc   feb1996.gd.dpc   mar1996.gd.dpc   apr1996.gd.dpc
    jan1997.gd.dpc   feb1997.gd.dpc   mar1997.gd.dpc   apr1997.gd.dpc
    jan1998.gd.dpc   feb1998.gd.dpc   mar1998.gd.dpc   apr1998.gd.dpc
    jan1999.gd.dpc   feb1999.gd.dpc   mar1999.gd.dpc   apr1999.gd.dpc
    jan2000.gd.dpc   feb2000.gd.dpc   mar2000.gd.dpc   apr2000.gd.dpc
    jan2001.gd.dpc                    mar2001.gd.dpc   apr2001.gd.dpc

    may1996.gd.dpc   jun1996.gd.dpc   jul1996.gd.dpc   aug1996.gd.dpc
    may1997.gd.dpc   jun1997.gd.dpc   jul1997.gd.dpc   aug1997.gd.dpc
    may1998.gd.dpc   jun1998.gd.dpc   jul1998.gd.dpc   aug1998.gd.dpc
    may1999.gd.dpc   jun1999.gd.dpc   jul1999.gd.dpc   aug1999.gd.dpc
    may2000.gd.dpc   jun2000.gd.dpc   jul2000.gd.dpc   aug2000.gd.dpc
    may2001.gd.dpc   jun2001.gd.dpc   jul2001.gd.dpc   aug2001.gd.dpc

    sep1996.gd.dpc   oct1996.gd.dpc   nov1996.gd.dpc   dec1996.gd.dpc
    sep1997.gd.dpc   oct1997.gd.dpc   nov1997.gd.dpc   dec1997.gd.dpc
    sep1998.gd.dpc   oct1998.gd.dpc   nov1998.gd.dpc   dec1998.gd.dpc
    sep1999.gd.dpc   oct1999.gd.dpc   nov1999.gd.dpc   dec1999.gd.dpc
    sep2000.gd.dpc   oct2000.gd.dpc   nov2000.gd.dpc   dec2000.gd.dpc
    sep2001.gd.dpc   oct2001.gd.dpc

    Data Format = 144 (longitude) columns by 91 (latitude) rows

    Grid Information
    DLon          = 2.5
    DLat          = 2.0
    Start Latitude  = -89.5
    Start Longitude = -180.0

    Longitudes of grid box mid-points:

    -180.000      -177.500      -175.000      -172.500
    -170.000      -167.500      -165.000      -162.500
    -160.000      -157.500      -155.000      -152.500
    -150.000      -147.500      -145.000      -142.500
    -140.000      -137.500      -135.000      -132.500
    -130.000      -127.500      -125.000      -122.500
    -120.000      -117.500      -115.000      -112.500
    -110.000      -107.500      -105.000      -102.500
    -100.000      -97.5000      -95.0000      -92.5000
    -90.0000      -87.5000      -85.0000      -82.5000
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     -80.0000        -77.5000        -75.0000        -72.5000
     -70.0000        -67.5000        -65.0000        -62.5000
     -60.0000        -57.5000        -55.0000        -52.5000
     -50.0000        -47.5000        -45.0000        -42.5000
     -40.0000        -37.5000        -35.0000        -32.5000
     -30.0000        -27.5000        -25.0000        -22.5000
     -20.0000        -17.5000        -15.0000        -12.5000
     -10.0000        -7.50000        -5.00000        -2.50000
      0.000000        2.50000         5.00000         7.50000
      10.0000         12.5000         15.0000         17.5000
      20.0000         22.5000         25.0000         27.5000
      30.0000         32.5000         35.0000         37.5000
      40.0000         42.5000         45.0000         47.5000
      50.0000         52.5000         55.0000         57.5000
      60.0000         62.5000         65.0000         67.5000
      70.0000         72.5000         75.0000         77.5000
      80.0000         82.5000         85.0000         87.5000
      90.0000         92.5000         95.0000         97.5000
      100.000         102.500         105.000         107.500
      110.000         112.500         115.000         117.500
      120.000         122.500         125.000         127.500
      130.000         132.500         135.000         137.500
      140.000         142.500         145.000         147.500
      150.000         152.500         155.000         157.500
      160.000         162.500         165.000         167.500
      170.000         172.500         175.000         177.500
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Latitudes of grid box mid-points:

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     -89.5000        -88.0000        -86.0000        -84.0000
     -82.0000        -80.0000        -78.0000        -76.0000
     -74.0000        -72.0000        -70.0000        -68.0000
     -66.0000        -64.0000        -62.0000        -60.0000
     -58.0000        -56.0000        -54.0000        -52.0000
     -50.0000        -48.0000        -46.0000        -44.0000
     -42.0000        -40.0000        -38.0000        -36.0000
     -34.0000        -32.0000        -30.0000        -28.0000
     -26.0000        -24.0000        -22.0000        -20.0000
     -18.0000        -16.0000        -14.0000        -12.0000
     -10.0000        -8.00000        -6.00000        -4.00000
     -2.00000         0.000000        2.00000         4.00000
      6.00000         8.00000         10.0000         12.0000
      14.0000         16.0000         18.0000         20.0000
      22.0000         24.0000         26.0000         28.0000
      30.0000         32.0000         34.0000         36.0000
      38.0000         40.0000         42.0000         44.0000
      46.0000         48.0000         50.0000         52.0000
      54.0000         56.0000         58.0000         60.0000
      62.0000         64.0000         66.0000         68.0000
      70.0000         72.0000         74.0000         76.0000
      78.0000         80.0000         82.0000         84.0000
      86.0000         88.0000         89.5000
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