README Documentation of Variables that Comprise Each Figure, Figs. 1 – 3 and S1 – S3

Description of Variables Used to Construct Figure 1

General Note: All analyzed variables correspond to the maps of either observed or modeled mean cloud top height (CTH) and PBL height ($PBLH_N$), as defined in the paper. These data are averaged between the months of August and November and the years 2006-2010.

smooth_max_low_cloud_height_modis_south_map: FLOAT = ARRAY [110,55]
Description: Mean MODIS cloud top height (CTH) in meters as screened from low clouds as defined in the text. Missing values and/or values over land are excluded and represented by "NAN". The longitude array is "lon_modis_south" and the latitude array is "lat_modis_south". Longitude is given in a [0,360] scale; subtract 360 from value in array to get negative longitude (°W) values. Array is smoothed with a boxcar average of width of two bins in both (longitude and latitude) directions.

cth_median_top_cloud_layer_calipso: FLOAT = ARRAY [22,15]
Description: Median CALIPSO cloud top height (CTH) in meters screened from low clouds as defined in the text. Missing values and/or values of land are excluded and represented by "NAN". The longitude array is "LONBIN_CALIPSO" and the latitude array is "LATBIN_CALIPSO". Longitude is given in a [0,360] scale; subtract 360 from value in array to get negative longitude (°W) values.

smooth_BL_height_gps: FLOAT = ARRAY[180,90]
Description: Mean $PBLH_N$ as observed by GPS-RO in meters as defined in the text. Heights over land are included. The longitude array is "gps_longitude_2x2", and the latitude array is "gps_latitude_2x2". Longitude is given in a [0,360] scale; for values above 180°, subtract 360 from value in array to get negative longitude (°W) values, if desired. Array is smoothed with a boxcar average of width of two bins in both (longitude and latitude) directions.

smooth_low_cloud_top_height_uppermost_cloud_cam5_base_south_map: FLOAT=ARRAY[89,59]
Description: Mean CAM5-Base cloud top height (CTH) in meters as screened from low clouds defined in the text. Heights over land are excluded and are represented by "NAN". Longitude is given in a [0,360] scale; subtract 360 from each value in array ("lon_cam5_base_south") to get negative longitude (°W) values. Latitude array is given by "lat_cam5_base_south". Array is smoothed with a boxcar average of width of two bins in both (longitude and latitude) directions.

smooth_low_cloud_top_height_uppermost_cloud_camclubb_south_map: FLOAT=ARRAY[77,59]
Description: Mean CAM5-CLUBB cloud top height (CTH) in meters as screened from low clouds defined in the text. Heights over land are excluded and are represented by "NAN". Longitude is given in a [0,360] scale; subtract 360 from each value in ("lon_camclubb_south") to get negative longitude (°W) values. Latitude array is given by "lat_camclubb_south". Array is smoothed with a boxcar average of width of two bins in both (longitude and latitude) directions.

smooth_low_cloud_top_height_uppermost_cloud_camclubb_south_hires_map: FLOAT=ARRAY[73,59]
Description: Mean High-Res CAM5-CLUBB cloud top height (CTH) in meters as screened from low clouds defined in the text. Heights over land are excluded and are represented by "NAN". Longitude is given in a [0,360] scale; subtract 360 from each value in ("lon_camclubb_south_hires") to get negative longitude (°W) values. Latitude array is given by "lat_camclubb_south_hires". Array is smoothed with a boxcar average of width of two bins in both (longitude and latitude) directions.

smooth_hpbl_grad_cam5_base_south_map_refractivity: FLOAT=ARRAY[89,59]
Description: Mean CAM5-Base $PBLH_N$ in meters as defined in the text. Heights over land are excluded and are represented by "NAN". Longitude is given in a [0,360] scale; subtract 360 from each value in array ("lon_cam5_base_south") to get negative longitude (°W) values. Latitude array is given by "lat_cam5_base_south". Array is smoothed with a boxcar average of width of two bins in both (longitude and latitude) directions.

smooth_hpbl_grad_camclubb_south_map_refractivity: FLOAT = ARRAY [77,59]
Description: Mean CAM5-CLUBB $PBLH_N$ in meters as defined in the text. Heights over land are excluded and are represented by "NAN". Longitude is given in a [0,360] scale; subtract 360 from each value in array ("lon_camclubb_south") to get negative longitude (°W) values. Latitude array is given by "lat_camclubb_south". Array is smoothed with a boxcar average of width of two bins in both (longitude and latitude) directions.

smooth_hpbl_grad_camclubb_hires_south_map_refractivity: FLOAT=ARRAY[73,59]
Description: Mean High-Res CAM5-CLUBB $PBLH_N$ in meters as screened from low clouds defined in the text. Heights over land are excluded and are represented by "NAN". Longitude is given in a [0,360] scale; subtract 360 from each value in ("lon_camclubb_south_hires") to get negative longitude (°W) values. Latitude array is given by "lat_camclubb_south_hires". Array is smoothed with a boxcar average of width of two bins in both (longitude and latitude) directions.

Description of Variables Used to Construct Figure 2

General Note: All analyzed variables below for Figure 2 are averaged between 19°S - 21°S and for ocean grids between 145°W and 70°W from all available or daily or instantaneous data between the months of August and November and the years 2006-2010.

cloud_fraction_calipso_with_cam5_hires_bins: FLOAT = ARRAY [38, 21]
Description: CALIPSO cloud fraction profiles along the cross section versus longitude, using the same bins as interpolated from the High-Res CAM5-CLUBB vertical bins. Missing data denoted as "NAN". The x-axis for longitude is represented by "longitude_bins_calipso_cloud_fraction", and the y-axis is "vertical_bins_calipso_with_cam5_hires_bins".

BL_height_gps_se_pac_cross_section_2x2_km: FLOAT = ARRAY [46]
Description: Mean GPS-RO $PBLH_N$ along the cross section versus longitude, with "gps_lon_se_pac_cross_section_2x2" the GPS-RO longitude bins

stderror_gps_cross_section_se_pac_km: FLOAT = ARRAY [46]
Description: The standard error in km, as defined in the paper, scaled by three, of GPS-RO $PBLH_N$ in each longitude bin ("gps_lon_se_pac_cross_section_2x2"). When added to and subtracted from "BL_height_gps_se_pac_cross_section_2x2_km", the 99% confidence interval at each mean observation is provided.

max_low_cloud_z_modis_cross_section_km: FLOAT = ARRAY [75]
Description: MODIS low cloud top height (CTH) in km along the cross section at each longitude, with "lon_modis_se_pac" the MODIS longitude bins.

stderror_max_low_cloud_z_modis_cross_section_km: FLOAT = ARRAY [75]
Description: The standard error in km, as defined in the paper, scaled by three, of MODIS CTH in each longitude bin ("lon_modis_se_pac"). When added to and subtracted from "max_low_cloud_z_modis_cross_section_km", the 99% confidence interval at each mean observation is computed.

cth_median_top_cloud_layer_calipso: FLOAT = ARRAY [19]
Description: CALIPSO low cloud top height (CTH) in km along the cross section at each longitude bin (4° bins), called "longitude_bins_calipso_cth".

cth_calipso_all_cloud_layer_stderror_km: FLOAT = ARRAY [19]
Description: The standard error in km, as defined in the paper, scaled by three, of CALIPSO CTH in each longitude bin ("longitude_bins_calipso_cth"). When added to and subtracted from "cth_median_top_cloud_layer_calipso", the 99% confidence interval at each mean observation is computed.

smooth_cloud_fraction_profiles_cam5_base_20S_x_section_low_cloud_only: FLOAT = ARRAY [73,30]
Description: CAM5-Base cloud fraction profiles along the cross section versus longitude. Missing data are denoted as "NAN". The x-axis for longitude is represented by "lon_cam5_base_se_pac", and the y-axis corresponding to each cloud fraction and each longitude is "height_profiles_cam5_base_20S_x_section_low_cloud_only_km", the heights in km.

smooth_low_cloud_top_height_uppermost_cam5_base_20S_vs_lon_km: FLOAT = ARRAY [73]
Description:
CAM5-Base low cloud top height (CTH) in km along the cross section at each longitude bin at the native resolution (1.25° bins), called "lon_cam5_base_se_pac".

stderror_low_cloud_top_height_uppermost_cam5_base_20S_vs_lon_km: FLOAT = ARRAY [73]
Description: The standard error in km, as defined in the paper, scaled by three, of CAM5-Base CTH in each longitude bin ("lon_cam5_base_se_pac"). When added to and subtracted from "smooth_low_cloud_top_height_uppermost_cam5_base_20S_vs_lon_km", the 99% confidence interval of each gridded CTH is computed.

smooth_cloud_fraction_profile_ecmwf_interim_20S: FLOAT = ARRAY [60,29]
Description: ECMWF-Interim screened low cloud top height along the cross section at each longitude bin at the native resolution (1.5° bins), "lon_ecmwf_interim_se_pac". The heights corresponding to each cloud fraction at each longitude along the cross section, in km, are represented by "geo_height_20S_ecmwf_interim_20S_km", with a size of [60,29].

smooth_cloud_fraction_profiles_camclubb_20S_x_section_low_cloud_only: FLOAT = ARRAY [73,30]
Description: CAM5-CLUBB cloud fraction profiles along the cross section versus longitude. Missing data are denoted as "NAN". The x-axis for longitude is represented by "lon_camclubb_se_pac", and the y-axis corresponding to each cloud fraction and each longitude is "height_profiles_camclubb_20S_x_section_low_cloud_only_km", the heights in km.

smooth_low_cloud_top_height_uppermost_camclubb_20S_vs_lon_km: FLOAT = ARRAY [73]

Description: CAM5-CLUBB low cloud top height (CTH) in km along the cross section at each longitude bin at the native resolution (1.25° bins), called “lon_camclubb_se_pac”.

stderror_low_cloud_top_height_uppermost_camclubb_20S_vs_lon_km: FLOAT = ARRAY [73]
Description: The standard error in km, as defined in the paper, scaled by three, of CAM5-CLUBB CTH in each longitude bin (“lon_camclubb_se_pac”). When added to and subtracted from “smooth_low_cloud_top_height_uppermost_camclubb_20S_vs_lon_km”, the 99% confidence interval of each gridded CTH is computed.

smooth_max_low_cloud_fraction_vs_lon_era_interim_20S: FLOAT = ARRAY [60]
Description: Maximum ERA-Interim cloud fraction within each mean profile for screened low cloud profiles as a function of longitude (“lon_ecmwf_interim_se_pac”) along the cross section. Array is smoothed with a boxcar average of width of two bins.

smooth_max_low_cloud_fraction_vs_lon_calipso_20S: FLOAT = ARRAY [38]
Description: Maximum CALIPSO cloud fraction within each mean profile for screened low cloud profiles as a function of longitude (“longitude_bins_calipso_cloud_fraction”) along the cross section. Array is smoothed with a boxcar average of width of two bins.

smooth_max_low_cloud_fraction_vs_lon_cam5_base_20S: FLOAT = ARRAY [73]
Description Maximum CAM5-Base cloud fraction within each mean profile for screened low cloud profiles as a function of longitude (“lon_cam5_base_se_pac”) along the cross section.

smooth_max_low_cloud_fraction_vs_lon_camclubb_20S: FLOAT = ARRAY [73]
Description Maximum CAM5-CLUBB cloud fraction within each mean profile for screened low cloud profiles as a function of longitude (“lon_camclubb_se_pac”) along the cross section.

smooth_max_low_cloud_fraction_vs_lon_camclubb_hires_20S: FLOAT = ARRAY [73]
Description Maximum High-Res CAM5-CLUBB cloud fraction within each mean profile for screened low cloud profiles as a function of longitude (“lon_camclubb_se_pac_hires”) along the cross section.

smooth_cloud_fraction_profiles_camclubb_hires_20S_x_section_low_cloud_only:
FLOAT = ARRAY [73,60]
Description: High-Res CAM5-CLUBB cloud fraction profiles along the cross section versus longitude. Missing data are denoted as “NAN”. The x-axis for longitude is represented by “lon_camclubb_se_pac_hires”, and the heights in km corresponding to each cloud fraction and each longitude is “height_profiles_camclubb_hires_20S_x_section_low_cloud_only_km”.

smooth_low_cloud_top_height_uppermost_camclubb_hires_20S_vs_lon_km: FLOAT = ARRAY [73]
Description: High-Res CAM5-CLUBB low cloud top height (CTH) in km along the cross section at each longitude bin at the native resolution (1.25° bins), called “lon_camclubb_se_pac_hires”.

stderror_low_cloud_top_height_uppermost_camclubb_hires_20S_vs_lon_km: FLOAT = ARRAY [73]
Description: The standard error in km, as defined in the paper, scaled by three, of High-Res CAM5-CLUBB CTH in each longitude bin (“lon_camclubb_se_pac_hires”). When added to and subtracted from “smooth_low_cloud_top_height_uppermost_camclubb_hires_20S_vs_lon_km”, the 99% confidence interval of each gridded CTH is computed.

Description of Variables Used to Construct Figure 3

General Note: All analyzed variables below for Figure 3 are between 15°S - 25°S at 145°W-210°W from all available or conditional instantaneous or daily data between the months of August and November and the years 2006-2010.

smooth_joint_dist_ecmwf_omega_profiles_vs_gps_pblh_with_modis: FLOAT = ARRAY [21,29]
Description: Smoothed (with a boxcar average along the x-axis of width of 2 bins, with no smoothing in the vertical) ECMWF ω profiles (pressure vertical velocity) conditional for bins of $PBLH_N$ of GPS-RO when there is a defined low cloud fraction as seen by MODIS. Units are in mb day^{-1}.

pbl_z_categories_mid: FLOAT = ARRAY [21]
Description: Midpoint categories of GPS-RO $PBLH_N$ in km for which ECMWF-Interim ω are conditioned, as well as for which MODIS CTH observations are conditioned.

pressure_ecmwf: FLOAT = ARRAY [29]
Description: Pressure levels in hPa of the ECMWF-Interim ω profiles.

smooth_joint_dist_modis_cloud_height_vs_gps_pblh: FLOAT = ARRAY [21,20]
Description: Smoothed (with a boxcar average along the x-axis of width of 2 bins, with no smoothing in the vertical) joint distribution of MODIS cloud top height and GPS-RO $PBLH_N$ between 15°S-25°S and 145°W and 210°W from all the daily data between the months of August and November and the years 2006-2010. PDFs add up to one within each $PBLH_N$ bin for which there are valid data. "cloud_z_categories_mid_km" are the vertical cloud top height bins in km to which the joint distribution corresponds.

cumulative_gps_ro_heights_new_method2: FLOAT = ARRAY [24]
Description: Cumulative probability density function of GPS-RO $PBLH_N$, with "pbl_z_categories_cumulative2" the bin categories in km

cumulative_modis_cloud_heights_new_method_fine: FLOAT = ARRAY [40]
Description: Cumulative probability density function of MODIS cloud top heights, with "cloud_z_categories_fine_km" the corresponding bin categories in km

cumulative_total_ztop_modified_20S_cam5_base: FLOAT = ARRAY [10]
Description: Cumulative probability density function of CAM5-Base cloud top height, with "mean_z_profile_cam5_base_for_cumulative_ztop_km" the bin categories in km

cumulative_total_ztop_modified_20S_camclubb: FLOAT = ARRAY [10]
Description: Cumulative probability density function of CAM5-CLUBB cloud top height, with "mean_z_profile_camclubb_for_cumulative_ztop_km" the bin categories in km

cumulative_total_ztop_modified_20S_camclubb_hires: FLOAT = ARRAY [20]
Description: Smoothed (with a boxcar average of width of 2 bins) cumulative probability density function of High-Res CAM5-CLUBB cloud top height, with "mean_z_profile_hires_camclubb_for_cumulative_ztop_km" the bin categories in km

smooth_cumulative_total_hpbl_modified_20S_cam5_base: FLOAT = ARRAY [21]

Description: Smoothed (with a boxcar average of 2 bins) cumulative probability density function of CAM5-BASE $PBLH_N$, with "pbl_z_categories_km" the bin categories in km

smooth_cumulative_total_hpbl_modified_20S_camclubb: FLOAT = ARRAY [21]
Description: Smoothed (with a boxcar average of 2 bins) cumulative probability density function of CAM5-CLUBB $PBLH_N$, with "pbl_z_categories_km" the bin categories in km

smooth_cumulative_total_hpbl_modified_20S_camclubb_hires: FLOAT = ARRAY [21]
Description: Smoothed (with a boxcar average of 2 bins) cumulative probability density function of High-Res CAM5-CLUBB $PBLH_N$, with "pbl_z_categories_km" the bin categories in km

smooth_omega_profiles_cam5_base_20S_vs_hpbl_modified: FLOAT = ARRAY [21, 30]
Description: Smoothed (with a boxcar average along the x-axis of 2 bins, with no smoothing in the vertical) CAM5-Base ω profiles (pressure vertical velocity) conditional for bins of $PBLH_N$ when there is a defined low cloud fraction as simulated by CAM5-Base. Units are in mb day^{-1}. $PBLH_N$ bins, the x-axis, are defined by "pbl_categories_modified_mid" (x-axis), and "smooth_pressure_profile_cam5_base_20S_vs_hpbl_modified" the pressure values in hPa corresponding to each CAM5-Base binned ω.

smooth_omega_profiles_camclubb_20S_vs_hpbl_modified: FLOAT = ARRAY [21, 30]
Description: Smoothed (with a boxcar average along the x-axis of 2 bins, with no smoothing in the vertical) CAM5-CLUBB ω profiles (pressure vertical velocity) conditional for bins of $PBLH_N$ when there is a defined low cloud fraction as simulated by CAM5-CLUBB. Units are in mb day^{-1}. $PBLH_N$ bins, the x-axis, are defined by "pbl_categories_modified_mid" (x-axis), and "smooth_pressure_profile_camclubb_20S_vs_hpbl_modified" the pressure values in hPa corresponding to each CAM5-CLUBB binned ω.

smooth_omega_profiles_camclubb_20S_vs_hpbl_hires_modified: FLOAT = ARRAY [21, 60]
Description: Smoothed (with a boxcar average along the x-axis of 2 bins, with no smoothing in the vertical) High-Res CAM5-CLUBB ω profiles (pressure vertical velocity) conditional for bins of $PBLH_N$ when there is a defined low cloud fraction as simulated by High-Res CAM5-CLUBB. Units are in mb day^{-1}. $PBLH_N$ bins, the x-axis, are defined by "pbl_categories_modified_mid" (x-axis), and "smooth_pressure_profile_camclubb_20S_vs_hpbl_hires_modified" the pressure values in hPa corresponding to each High-Res CAM5-CLUBB binned ω.

smooth_dist_ztop_cam5_base_20S_vs_hpbl_modified: FLOAT = ARRAY [21, 29]
Description: Smoothed (with a boxcar average along the x-axis of 2 bins, with no smoothing in the vertical) CAM5-BASE joint distribution of cloud top height and $PBLH_N$. $PBLH_N$ bins (x-axis) are represented in km by "pbl_categories_modified_mid", and "smooth_z_profile_for_deriv_20S_vs_hpbl_modified_cam5_base" the heights corresponding to each cloud top height. PDFs add up to one within each $PBLH_N$ bin for which there are valid data.

smooth_dist_ztop_camclubb_20S_vs_hpbl_modified: FLOAT = ARRAY [21, 29]
Description: Smoothed (with a boxcar average along the x-axis of 2 bins, with no smoothing in the vertical) CAM5-CLUBB joint distribution of cloud top height and $PBLH_N$. $PBLH_N$ bins (x-axis) are represented in km by "pbl_categories_modified_mid", and "smooth_z_profile_for_deriv_20S_vs_hpbl_modified" the heights corresponding to each cloud top height. PDFs add up to one within each $PBLH_N$ for which there are valid data.

smooth_dist_ztop_camclubb_20S_vs_hpbl_hires_modified: FLOAT = ARRAY [21, 59]
Description: Smoothed (with a boxcar average along the x-axis of 2 bins, with no smoothing in the vertical) High-Res CAM5-CLUBB joint distribution of cloud top height and $PBLH_N$. $PBLH_N$ bins (x-axis) are represented in km by "pbl_categories_modified_mid", and "smooth_z_profile_for_deriv_20S_vs_hpbl_hires_modified" the heights corresponding to each cloud top height. PDFs add up to one within each $PBLH_N$ for which there are valid data.

Description of Variables Used to Construct Figure S1

smooth_omega700_south_map: FLOAT = ARRAY [110, 55]
Description: Mean ERA-Interim pressure vertical velocity (ω) at 700 hPa averaged over the months of August through November and 2006 through 2010 at 1°x1° resolution over the Southeast Pacific. Longitude bins are "lon_ecmwf_1x1", and latitude bins are "lat_ecmwf_1x1". For presentation purposes, the ω_{700} array is smoothed with a boxcar average of width of two bins in both (longitude and latitude) directions. Units are in mb day^{-1}. For longitude values, subtract 360 from value in array to get negative longitude (°W) values.

smooth_omega700_cam5_base_south_map: FLOAT = ARRAY [89, 59]
Description: Mean CAM5-Base pressure vertical velocity (ω) at 700 hPa averaged over the months of August through November and 2006 through 2010 at 1°x1° resolution over the Southeast Pacific. Longitude bins are "lon_cam5_base_south", and latitude bins are "lat_cam5_base_south". For presentation purposes, the ω_{700} array is smoothed with a boxcar average of width of two bins in both (longitude and latitude) directions. Units are in mb day^{-1}. For longitude values, subtract 360 from value in array to get negative longitude (°W) values.

smooth_omega700_camclubb_south_map: FLOAT = ARRAY [77,59]
Description: Mean CAM5-Base pressure vertical velocity (ω) at 700 hPa averaged over the months of August through November and 2006 through 2010 at 1°x1° resolution over the Southeast Pacific. Longitude bins are "lon_camclubb_south", and latitude bins are "lat_camclubb_south". For presentation purposes, the ω_{700} array is smoothed with a boxcar average of width of two bins in both (longitude and latitude) directions. Units are in mb day^{-1}. For longitude values, subtract 360 from value in array to get negative longitude (°W) values.

smooth_omega700_camclubb_south_map_hires FLOAT = ARRAY [73,59]
Description: Mean CAM5-Base pressure vertical velocity (ω) at 700 hPa averaged over the months of August through November and 2006 through 2010 at 1°x1° resolution over the Southeast Pacific. Longitude bins are "lon_camclubb_south_hires", and latitude bins are "lat_camclubb_south_hires". For presentation purposes, the ω_{700} array is smoothed with a boxcar average of width of two bins in both (longitude and latitude) directions. Units are in mb day^{-1}. For longitude values, subtract 360 from value in array to get negative longitude (°W) values.

Description of Variables Used to Construct Figure S2

All arrays for Figure S2 are of profiles of refractivity gradient (∂N/∂Z) in units of N-Units/km along 20°S during August-November 2006-2010 for the three versions of CAM5 and GPS-RO.

dN_dZ_profiles_cam5_base_20S_N_per_km: FLOAT = ARRAY [73,30]
Description: Profiles of ∂N/∂Z from CAM5-Base, with full details given in the text. The longitude bins are represented by "lon_cam5_base_south_for_dN_dZ", and "height_profiles_cam5_base_20S_km" in km is the array of heights corresponding to each layer and each longitude.

dN_dZ_profiles_camclubb_20S_N_per_km: FLOAT = ARRAY [73,30]
Description: Profiles of ∂N/∂Z from CAM5-CLUBB, with full details given in the text. The longitude bins are represented by "lon_camclubb_south_for_dN_dZ", and "height_profiles_camclubb_20S_km" in km is the array of heights corresponding to each layer and each longitude.

dN_dZ_profiles_camclubb_hires_20S_N_per_km: FLOAT = ARRAY [73,30]
Description: Profiles of ∂N/∂Z from CAM5-Base, with full details given in the text. The longitude bins are represented by "lon_camclubb_south_hires_for_dN_dZ", and "height_profiles_camclubb_hires_20S_km" in km is the array of heights corresponding to each layer and each longitude.

dN_dZ_profiles_gps_N_per_km: FLOAT = ARRAY [45,60]
Description: Profiles of ∂N/∂Z from GPS-RO, with longitude bins of "gps_lon", and height bins contained in "height_gps_km".

Description of Variables Used to Construct Figure S3

General Description: 9 of the twelve variables are joint distributions of cloud top height (CTH) and $PBLH_N$, either from observations – MODIS/GPS-RO, or from two of the three versions of CAM5 – CAM5-Base and CAM5-CLUBB, with different conditions for each distribution, as thoroughly described in the legend of Figure S3. Three of the joint PDFs are the same as presented in Figure 3, but they are included here for convenience, since they are presented in Figure S3. Pressure vertical velocity (ω) profiles under different subsidence (or all) conditions as a function of $PBLH_N$ are also included for CAM5-Base. All the joint distributions and ω profiles from Figure S3 are analyzed between 15°S-25°S and 145°W and 210°W, the same region as in Figure 3. Missing data for any $PBLH_N$ bins denoted as "NAN".

smooth_joint_dist_modis_cloud_height_vs_gps_pblh_subsidence_aloft: FLOAT = ARRAY [21,20]
Description: Joint PDFs of observational MODIS cloud top height (CTH) and GPS-RO $PBLH_N$ for conditions in which there is daily-mean subsidence aloft at 575 hPa ($\omega_{575} > 0$ mb/day) as determined by ERA-Interim reanalysis data. Smoothed with a boxcar average along the x-axis of width of two bins, with no smoothing in the vertical. PDFs add up to one within each $PBLH_N$ bin for which there are valid data for the $PBLH_N$ conditions. The $PBLH_N$ bins in km are given by "pbl_z_categories_mid_km", and "cloud_z_categories_mid_km" are the vertical cloud top height bins in km. Missing data for any $PBLH_N$ bins denoted as "NAN".

smooth_joint_dist_modis_cloud_height_vs_gps_pblh_subsidence_both_modes: FLOAT = ARRAY [21,20]
Description: Joint PDFs of observational MODIS cloud top height (CTH) and GPS-RO $PBLH_N$ for conditions in which there is daily-mean subsidence both at 575 hPa and at 800 hPa, as determined by ERA-Interim reanalysis data. Smoothed with a boxcar average along the x-axis of width of two bins, with no smoothing in the vertical. PDFs add up to one within each $PBLH_N$ bin for which there are valid data for the $PBLH_N$ conditions. The $PBLH_N$ bins in km are given by "pbl_z_categories_mid_km", and "cloud_z_categories_mid_km" are the vertical cloud top height bins in km. Missing data for any $PBLH_N$ bins denoted as "NAN".

smooth_joint_dist_modis_cloud_height_vs_gps_pblh: FLOAT = ARRAY [21,20]
Description: Joint PDFs of observational MODIS cloud top height (CTH) and GPS-RO $PBLH_N$ without any conditions of subsidence. Smoothed with a boxcar average along the x-axis of width of two bins, with no smoothing in the vertical. PDFs add up to one within each $PBLH_N$ bin for which there are valid data for the $PBLH_N$ conditions. The $PBLH_N$ bins in km are given by "pbl_z_categories_mid_km", and "cloud_z_categories_mid_km" are the vertical cloud top height bins in km. Missing data for any $PBLH_N$ bins denoted as "NAN".

smooth_dist_ztop_cam5_base_20S_vs_hpbl_modified_subsidence_aloft FLOAT = ARRAY [21,29]
Description: Joint PDFs of modeled CAM5-Base cloud top height (CTH) and $PBLH_N$ for conditions in which there is instantaneous subsidence aloft at 575 hPa ($\omega_{575} > 0$ mb/day) as determined by simulated CAM5-Base data. Smoothed with a boxcar average along the x-axis of width of two bins, with no smoothing in the vertical. PDFs add up to one within each $PBLH_N$ bin for which there are valid data for the $PBLH_N$ conditions. The $PBLH_N$ bins in km are given by "pbl_categories_modified_mid_km", and "smooth_z_profile_for_deriv_20S_vs_hpbl_modified_cam5_base_km" are the vertical cloud top height bins in km. The latter is smoothed with a boxcar average along the x-axis of width of two bins, with no smoothing in the vertical. Missing data for any $PBLH_N$ bins denoted as "NAN".

smooth_dist_ztop_cam5_base_20S_vs_hpbl_modified_subsidence_both_modes:
FLOAT = ARRAY [21,29]
Description: Joint PDFs of modeled CAM5-Base cloud top height (CTH) and $PBLH_N$ for conditions in which there is instantaneous subsidence aloft at both 575 hPa ($\omega_{575} > 0$ mb/day) and at 800 hPa ($\omega_{800} > 0$ mb/day) as determined by simulated CAM5-Base data. Smoothed with a boxcar average along the x-axis of width of two bins, with no smoothing in the vertical. PDFs add up to one within each $PBLH_N$ bin for which there are valid data for the $PBLH_N$ conditions . The $PBLH_N$ bins in km are given by "pbl_categories_modified_mid_km", and "smooth_z_profile_for_deriv_20S_vs_hpbl_modified_cam5_base_km" are the vertical cloud top height bins in km. The latter is smoothed with a boxcar average along the x-axis of width of two bins, with no smoothing in the vertical. Missing data for any $PBLH_N$ bins denoted as "NAN".

smooth_dist_ztop_cam5_base_20S_vs_hpbl_modified: FLOAT = ARRAY [21,29]
Description: Joint PDFs of modeled CAM5-Base cloud top height (CTH) and $PBLH_N$ without any conditions of subsidence. Smoothed with a boxcar average along the x-axis of width of two bins, with no smoothing in the vertical. PDFs add up to one within each $PBLH_N$ bin for which there are valid data for the $PBLH_N$ conditions. The $PBLH_N$ bins in km are given by "pbl_categories_modified_mid_km", and "smooth_z_profile_for_deriv_20S_vs_hpbl_modified_cam5_base_km" are the vertical cloud top height bins in km. The latter is smoothed with a boxcar average along the x-axis of width of two bins, with no smoothing in the vertical. Missing data for any $PBLH_N$ bins denoted as "NAN".

smooth_dist_ztop_camclubb_20S_vs_hpbl_modified_subsidence_aloft FLOAT = ARRAY [21,29]
Description: Joint PDFs of modeled CAM5-CLUBB cloud top height (CTH) and $PBLH_N$ for conditions in which there is instantaneous subsidence aloft at 575 hPa ($\omega_{575} > 0$ mb/day) as determined by simulated CAM5-CLUBB data. Smoothed with a boxcar average along the x-axis of width of two bins, with no

smoothing in the vertical. PDFs add up to one within each $PBLH_N$ bin for which there are valid data for the $PBLH_N$ conditions. The $PBLH_N$ bins in km are given by "pbl_categories_modified_mid_km", and "smooth_z_profile_for_deriv_20S_vs_hpbl_modified_camclubb_km" are the vertical cloud top height bins in km. The latter is smoothed with a boxcar average along the x-axis of width of two bins, with no smoothing in the vertical. Missing data for any $PBLH_N$ bins denoted as "NAN".

smooth_dist_ztop_cam5_base_20S_vs_hpbl_modified_subsidence_both_modes:
FLOAT = ARRAY [21,29]
Description: Joint PDFs of modeled CAM5-Base cloud top height (CTH) and $PBLH_N$ for conditions in which there is instantaneous subsidence aloft at both 575 hPa ($\omega_{575} > 0$ mb/day) and at 800 hPa ($\omega_{800} > 0$ mb/day) as determined by simulated CAM5-Base data. Smoothed with a boxcar average along the x-axis of width of two bins, with no smoothing in the vertical. PDFs add up to one within each $PBLH_N$ bin for which there are valid data for the $PBLH_N$ conditions . The $PBLH_N$ bins in km are given by "pbl_categories_modified_mid_km", and "smooth_z_profile_for_deriv_20S_vs_hpbl_modified_cam5_base_km" are the vertical cloud top height bins in km. The latter is smoothed with a boxcar average along the x-axis of width of two bins, with no smoothing in the vertical. Missing data for any $PBLH_N$ bins denoted as "NAN".

smooth_dist_ztop_cam5_base_20S_vs_hpbl_modified: FLOAT = ARRAY [21,29]
Description: Joint PDFs of modeled CAM5-Base cloud top height (CTH) and $PBLH_N$ without any conditions of subsidence. Smoothed with a boxcar average along the x-axis of width of two bins, with no smoothing in the vertical. PDFs add up to one within each $PBLH_N$ bin for which there are valid data for the $PBLH_N$ conditions. The $PBLH_N$ bins in km are given by "pbl_categories_modified_mid_km", and "smooth_z_profile_for_deriv_20S_vs_hpbl_modified_cam5_base_km" are the vertical cloud top height bins in km. The latter is smoothed with a boxcar average along the x-axis of width of two bins, with no smoothing in the vertical. Missing data for any $PBLH_N$ bins denoted as "NAN".

smooth_omega_profiles_cam5_base_20S_vs_hpbl_modified_subsidence_aloft: FLOAT = ARRAY [21,30]
Description: Pressure vertical velocity (ω) profiles from CAM5-Base as a function of $PBLH_N$ bins for which there is instantaneous subsidence aloft at 575 hPa ($\omega_{575} > 0$ mb/day). Smoothed with a boxcar average along the x-axis of width of two bins, with no smoothing in the vertical. The $PBLH_N$ bins are given by "pbl_categories_modified_mid_km", and "smooth_pressure_profile_cam5_base_20S_vs_hpbl_modified_hpa" represents the pressure levels in hPa which correspond to each value of "smooth_omega_profiles_cam5_base_20S_vs_hpbl_modified_subsidence_aloft". The pressure profiles along $PBLH_N$ are smoothed with a boxcar average along the x-axis of width of two bins, with no smoothing in the vertical. Missing data for any $PBLH_N$ bins denoted as "NAN".

smooth_omega_profiles_cam5_base_20S_vs_hpbl_modified_subsidence_both_modes:
FLOAT = ARRAY [21,30]
Description: Pressure vertical velocity (ω) profiles from CAM5-Base as a function of $PBLH_N$ bins for which there is instantaneous subsidence aloft at 575 hPa ($\omega_{575} > 0$ mb/day) and also at 800 hPa ($\omega_{800} > 0$ mb/day). Smoothed with a boxcar average along the x-axis of width of two bins, with no smoothing in the vertical. The $PBLH_N$ bins are given by "pbl_categories_modified_mid_km", and "smooth_pressure_profile_cam5_base_20S_vs_hpbl_modified_hpa" represents the pressure levels in

hPa which correspond to each value of
"smooth_omega_profiles_cam5_base_20S_vs_hpbl_modified_subsidence_both_modes". The pressure profiles along $PBLH_N$ are smoothed with a boxcar average along the x-axis of width of two bins, with no smoothing in the vertical. Missing data for any $PBLH_N$ bins denoted as "NAN".

smooth_omega_profiles_cam5_base_20S_vs_hpbl_modified:
FLOAT = ARRAY [21,30]
Description: Instantaneous pressure vertical velocity (ω) profiles from CAM5-Base as a function of $PBLH_N$ bins for which there are no subsidence conditions. Smoothed with a boxcar average along the x-axis of width of two bins, with no smoothing in the vertical. The $PBLH_N$ bins are given by "pbl_categories_modified_mid_km", and
"smooth_pressure_profile_cam5_base_20S_vs_hpbl_modified_hpa" represents the pressure levels in hPa which correspond to each "smooth_omega_profiles_cam5_base_20S_vs_hpbl_modified". The pressure profiles along $PBLH_N$ are smoothed with a boxcar average along the x-axis of width of two bins, with no smoothing in the vertical. Missing data for any $PBLH_N$ bins denoted as "NAN".

smooth_dist_ztop_camclubb_20S_vs_hpbl_modified_subsidence_aloft: FLOAT = ARRAY [21,29]
Description: Joint PDFs of modeled CAM5-CLUBB cloud top height (CTH) and $PBLH_N$ for conditions in which there is instantaneous subsidence aloft at 575 hPa ($\omega_{575} > 0$ mb/day) as determined by simulated CAM5-CLUBB data. Smoothed with a boxcar average along the x-axis of width of two bins, with no smoothing in the vertical. PDFs add up to one within each $PBLH_N$ bin for which there are valid data for the $PBLH_N$ conditions. The $PBLH_N$ bins in km are given by "pbl_categories_modified_mid_km", and "smooth_z_profile_for_deriv_20S_vs_hpbl_modified_camclubb_km" are the vertical cloud top height bins in km. The latter is smoothed with a boxcar average along the x-axis of width of two bins, with no smoothing in the vertical. Missing data for any $PBLH_N$ bins denoted as "NAN".

smooth_dist_ztop_camclubb_20S_vs_hpbl_modified_subsidence_both_modes: FLOAT = ARRAY [21,29]
Description: Joint PDFs of modeled CAM5-CLUBB cloud top height (CTH) and $PBLH_N$ for conditions in which there is instantaneous subsidence aloft at both 575 hPa ($\omega_{575} > 0$ mb/day) and at 800 hPa ($\omega_{800} > 0$ mb/day) as determined by simulated CAM5-CLUBB data. Smoothed with a boxcar average along the x-axis of width of two bins, with no smoothing in the vertical. PDFs add up to one within each $PBLH_N$ bin for which there are valid data for the $PBLH_N$ conditions. The $PBLH_N$ bins in km are given by "pbl_categories_modified_mid_km", and
"smooth_z_profile_for_deriv_20S_vs_hpbl_modified_camclubb_km" are the vertical cloud top height bins in km. The latter is smoothed with a boxcar average along the x-axis of width of two bins, with no smoothing in the vertical. Missing data for any $PBLH_N$ bins denoted as "NAN".

smooth_dist_ztop_camclubb_20S_vs_hpbl_modified: FLOAT = ARRAY [21,29]
Description: Joint PDFs of modeled CAM5-CLUBB cloud top height (CTH) and $PBLH_N$ without any conditions of subsidence. Smoothed with a boxcar average along the x-axis of width of two bins, with no smoothing in the vertical. PDFs add up to one within each $PBLH_N$ bin for which there are valid data for the $PBLH_N$ conditions. The $PBLH_N$ bins in km are given by "pbl_categories_modified_mid_km", and "smooth_z_profile_for_deriv_20S_vs_hpbl_modified_camclubb_km" are the vertical cloud top height bins in km. The latter is smoothed with a boxcar average along the x-axis of width of two bins, with no smoothing in the vertical. Missing data for any $PBLH_N$ bins denoted as "NAN".