Description of the Fields in the Matchup Database

This section provides a detailed description of the fields included in the AVHRR Oceans Pathfinder Matchup Data Base Version 19. The short variable name shown in square brackets for each field corresponds to the field names listed in the header of each matchup file. The variable names in brackets are also used in the "Record Filtering and Flagging" section. For all fields, missing values are denoted as "NA".

Field 1 [yymmdd] Gregorian date of the *in situ* SST. The format is YYMMDD, where YY are the last two digits of the year, MM is the month and DD is the day of the month.

Field 2 [hhmmss] Time (UTC) of the *in situ* SST. Note that, for most in situ platforms, this is the time at which SST is reported; the actual observation may have taken place slightly earlier. Data from the TOGA/TAO moored buoys are an exception: the times listed correspond to the center of the period over which a given SST measurement is averaged (see *section* "Compilation and Reformatting of In Situ Data"). Format is HH:MM:SS, where HH are hours, MM are minutes and SS are seconds.

Field 3 [satpftime] Time of the AVHRR observation. Time is in Pathfinder seconds (seconds since 1 January 1981 00:00:00 UTC). The calculation of both *in situ* (Field 57) and satellite times (this field) ignores leap seconds, so the two "Pathfinder times" should be directly comparable.

Fields 4–5 [slon,slat] Latitude and longitude (in decimal degrees) of the center pixel in the 5x5 pixel AVHRR extraction box. South latitudes and West longitudes are negative.

Field 6 [solz] Solar zenith angle (in decimal degrees). Useful for separating daytime and nighttime data (values > 90° correspond to nightime).

Field 7 [satz] Satellite zenith angle (in decimal degrees).

Field 8 [azim] Difference between satellite and solar azimuth angles.The satellite and solar azimuth angles are calculated by projecting onto the Earth's surface the vectors from the surface to the satellite and Sun, respectively. These angles are measured clockwise from the North to the East, and values are reduced to a -180° to 180° coordinate system. This quantity was used to estimate whether pixels were viewed when the AVHRR was looking in a direction towards the Sun (see Field 9 description). Units are decimal degrees.

Field 9 [sunside] Flag for matchups in the Sun side of the AVHRR scan. This flags identifies pixels viewed by the AVHRR while looking towards the Sun. That is, it identifies pixels on the side of the scan which potentially might be contaminated by solar glint. The value of Field 8 (azim) was used to compute this flag. If the absolute value of azim was > 90°, the AVHRR was looking toward the Sun and Field9 was set to "yes"; otherwise, the field was set to "no".

Field 10 [glint] Sun glint index. The value is computed using the Cox and Munk (1954) formulation, assuming a nominal surface wind speed of 6 m s^{-1}. Units are sr^{-1}. A value greater than 0.005 sr^{-1} generally indicates significant presence of sun glint.

Fields 11–12 [ral1,ral2] Rayleigh scattering for channels 1 and 2, respectively. These values are used to convert albedo values into tau (aerosol optical thickness). Rayleigh scattering is calculated by a method similar to that described by Gordon et al. (1988).Also, see description for Fields 13–14. Units are percent.

Fields 13–14 [aerch1,aerch2] Aerosol scale factors for channels 1 and 2, respectively. The scale factor is a function of both the geometry and the aerosol scattering phase function model used in the atmospheric correction. For the AVHRR Oceans Pathfinder, a single aerosol phase function was used representing a non-absorbing standard marine aerosol with 80% relative humidity. The aerosol model

does not correct for multiple scattering, and may result in >20% errors at large satellite zenith angles (Gordon and Castaño, 1987). The values for these fields are used to convert albedo to tau. The computation of tau is as follows: $tau_i = (albedo_i - ral_i) / aer_i$, where $albedo_i$ is the albedo value, ral_i is the Rayleigh scattering (Field 11 or 12) and aer_i is the aerosol scale factor (Field 13 or 14). The index i denotes channel 1 or 2.

Field 15 [prt] Temperature (°C) of the baseplate to which the internal calibration blackbody is attached. This field is the average of measurements taken by four separate platinum resistance thermometers (PRTs) and is usually assumed to represent the temperature of the internal blackbody. The four individual PRT measurements are listed in Fields 16–19.

Fields 16–19 [prt1, prt2, prt3, prt4] Blackbody baseplate temperatures (in °C) measured by each of the four platinum resistance thermometers. The average of these four measurements is listed in Field 15.

Fields 20–22 [em3, em4, em5] Ocean surface emissivity values (no units) for AVHRR channels 3, 4 and 5. The emissivity of the ocean surface changes as a function of viewing geometry. The values given here were interpolated from tables given in Bramson (1968, Tables 183–191) to the absolute value of the satellite zenith angle (Field 7) for each matchup. The values were then convolved with the AVHRR sensor response function.

Fields 23–25 [slope3, slope4, slope5] Slope of counts-to-radiance calibration lines derived from the active in-flight calibration scheme, AVHRR channels 3–5. Units for these fields (mW $m^2cm^{-1}sr^1count^{-1}$) indicate radiance per sensor count. Calibration slopes and intercepts (see Fields 26–28) are first calculated for blocks of 200 GAC scan lines. The slopes and intercepts listed in the PFMDB are calculated by linear interpolation between adjacent blocks.

Fields 26–28 [intcp3, intcp4, incp5] Intercept of counts-to-radiance calibration lines equations derived from the active in-flight calibration scheme, AVHRR channels 3–5. Units are mW m^{-2} cm^{-1} sr^{-1}. See description of Fields 23–25 for more details.

Fields 29–33 [ch1 ch5] Central value in 5x5 extraction box for AVHRR channels1–5. The values for channels 1 and 2 (no units) are approximate aerosol optical thicknesses, calculated using an approximation used for the Coastal Zone Color Scanner data (H. Gordon, personal communication); values for channels 3, 4 and 5 are brightness temperatures (in °C).

Fields 34–38 [med1med5] Median of the 9 pixel values in the 3x3 box in the center of the 5x5 extraction box for AVHRR channels1–5. Computed to get a robust estimate of central tendency in the 3x3 box. Note that the median values (and other summary statistics) are provided for 3x3 boxes for consistency with earlier versions of the PFMDB. Units are as in Fields 29–33.

Fields 39–43 [min1...min5] Minimum value in central 3x3 box for AVHRR channels1–5. Units are as in Fields 29–33.

Fields 44–48 [max1...max5] Maximum value in central 3x3 box for AVHRR channels1–5. Units are as in Fields 29–33.

Fields 49–53 [av1...av5] Average of the 9 pixel values in central 3x3 box for AVHRR channels1–5. Units are as in Fields 29–33.

Fields 54–56 [cem3,cem4,cem5] Central value of the 5x5 extraction box for AVHRR channels3–5, with emissivity correction. The emissivity values are listed in Fields 20–22. Note that one cannot simply divide the uncorrected brightness temperatures (Fields 31–33) by the emissivity in order to correct for an ocean surface emissivity lower than 1. Instead, the correction is performed on the radiances for each channel, which are then converted to brightness temperatures. Also, note that the emissivity correction is increasingly incorrect as atmospheric absorption increases (e.g., as water vapor increases). As atmospheric turbidity increases, the radiance emitted by the ocean surface (the component that needs to be corrected for emissivity) represents a decreasing proportion of the total radiance sensed. Conversely, the atmospheric or path radiance (which should not be corrected for surface emissivity) accounts for an increasing proportion of the total radiance.

Field 57 [bdate] Time of *in situ* SST report in Pathfinder seconds (seconds since 1 January 1981 00:00:00 UTC). The corresponding Gregorian date and UTC time are listed in fields 1 and 2.

Fields 58–59 [blat, blon] Latitude and longitude of *in situ* SST observation (in decimal degrees). South latitudes and West longitudes are negative.

Field 60 [bid] *In situ* platform ID. The original ID number was modified to facilitate separation of *in situ* data from different sources. See section on *in situ* data and Table 1 for further details.

Field 61 [bsst] *In situ* SST (°C).

Fields 62–63 [wdir, wsp] *In situ* measurements of wind direction and speed. Units are degrees (range: 0° to 360°), and m s^{-1}, respectively. Note that only a portion of the matchups include values for these quantities, usually those for some of the moored platforms.

Field 64 [airt] *In situ* air temperature (°C).Note that only a portion of the matchups include values for these quantities, usually those for some of the moored platforms.

Field 65 [pass] Result from the cloud tests described in the section "Record Filtering and Flagging". A value of 1 indicates that a matchup record passed the tests and have good quality; otherwise the value is 0.

Fields 66–90 [ch111...ch155] Values for all 25 pixels in 5x5 extraction box, AVHRR channel 1. Values are in albedo (%). Note that even though summary statistics for channels 1 and 2 are presented for aerosol optical thickness, the individual pixel values are given as albedo. Aerosol optical thickness for the individual pixels could be computed as detailed in the description of Fields 13–14, using values in Field 11 and Field 13. The 25 pixel values are arranged row-wise, beginning from the upper left corner of the extraction box.

Fields 91–115 [ch211...ch255] Values for all 25 pixels in 5x5 extraction box, AVHRR channel 2. Values are in albedo (%). Note that even though summary statistics for channels 1 and 2 are presented for aerosol optical thickness, the individual pixel values are given as albedo. Aerosol optical thickness for the individual pixels could be computed as detailed in the description of Fields 13–14, using values in Field 12 and Field 14. The 25 pixel values are arranged row-wise, beginning from the upper left corner of the extraction box.

Fields 116–140 [ch311...ch355] Brightness temperatures (°C) for all 25 pixels in 5x5 extraction box, AVHRR channel 3. The 25 pixel values are arranged row-wise, beginning from the upper left corner of the extraction box.

Fields 141–165 [ch411...ch455] Brightness temperatures (°C) for all 25 pixels in 5x5 extraction box, AVHRR channel 4. The 25 pixel values are arranged row-wise, beginning from the upper left corner of the extraction box.

Fields 166–190 [ch511...ch555] Brightness temperatures (°C) for all 25 pixels in 5x5 extraction box, AVHRR channel 5. The 25 pixel values are arranged row-wise, beginning from the upper left corner of the extraction box.

Field 191 [basin] Basin code. Name of major ocean basin or enclosed body of water in which matchup is located. Note that values of "land" are possible due to the coarseness of the land mask (i.e., the apparent land locations are very close to shore). See section "Ancillary Data" for details.

Field 192 [depth] Depth in meters of the water column at location of observation. The depth value was extracted from the NOAA's National Geophysical Data Center (NGDC) ETOPO5 earth topography 5-minute resolution database. More information on this data base can be found in http://www.ngdc.noaa.gov.

Field 193 [oisst] Reynolds weekly Optimally-Interpolated SST (OISST) value for grid point nearest to matchup location. Units are °C. See section "Ancillary Data" for details.

Field 194 [ssmiwv] Atmospheric columnar water vapor. Extracted from SSM/I geophysical database produced by Wentz (1991). Currently available for the period July 1987–December 1992,1995,1996. Units are g cm^{-2}. See section "Ancillary Data" for details.

Field 195 [mpfsst] Satellite derived SST (units are °C) calculated using the MPFSST algorithm. This value was calculated using coefficients developed for version 4 of the Pathfinder global SST fields.

Note, however, that this value was computed using the *in situ* buoy temperature as the first-guess SST required by the MPFSST algorithm. The global SST fields, in contrast, were computed using interpolated Reynolds SSTs as the first-guess SST.

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Page last Updated: Friday, January 28, 2000 at 4:15 PM

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