

SIMBAD RADIOMETER - INSTRUCTIONS

The SIMBAD radiometer measures direct sunlight intensity by viewing the sun, and water-leaving radiance by viewing the ocean surface at 45 degrees from nadir and 135 degrees from the sun's vertical plane. It uses a vertical polarizer to reduce skylight reflection. The spectral bands are centered at 443, 490, 560, 670, and 870 nm. The instrument is powered by batteries, which allow about 6 hours of continuous use. Accessories include 1) a GPS antenna, 2) a cable for charging the batteries, and 3) a rs232 cable to download the data.

1. Operating the instrument

1) Connect the GPS antenna to the instrument, and secure the GPS antenna horizontally outside, on a ship structure. The GPS has a magnetic bottom that allows easy fixation on the ship. Avoid stepping on the cable, or putting unnecessary tension to the cable (connection may break).

2) Put the option knob on position PC, and turn the instrument on. The knob must be on the PC position before turning the instrument on. The two red and yellow lights will blink alternatively until the GPS is initialized. This may take up to two-three minutes. When the GPS is initialized, there is a beep, and all the lights go off. If the GPS acquisition is not effected after two-three minutes, push the red button, turn the instrument off, and turn the instrument on again. At the beginning of a leg, or when changing GPS antenna, the GPS acquisition may take longer than two-three minutes, sometimes as long as thirty minutes. To avoid waiting too long for GPS acquisition at the time of measurements, initialize GPS at the beginning of each leg.

3) Select one of three scenarios/modes, namely DRK (measurement of dark current), SUN (sun viewing), or SEA (ocean viewing). The experimental procedure is to make, consecutively, one DRK measurement, three SUN measurements, six SEA measurements, three SUN measurements, and one DRK measurement.

-DRK mode: Put knob in DRK position. Place cover at the end of collimator and/or dark cloth, so that no light can enter the instrument. Press the red button. The

two red lights will blink, until the end of the measurement. The measurement lasts 20 seconds. A beep indicates the end of the measurement.

-SUN mode: Put knob in SUN position. Aim at the sun by imaging the sun through the small holes of the collimator unit, and press the red button. The measurement lasts 10 seconds. A beep indicates the end of the measurement.

-SEA mode: Put knob in SEA position. Go to the side of the ship (preferentially the bow), and aim at the ocean, after having approximately positioned the instrument at 135 degrees from the sun's vertical plane. The black structure with the lights should be positioned vertically. The two yellow lights will both turn on when the nadir angle is 45 degrees. Press the red button. The measurement lasts 10 seconds. A beep indicates the end of the measurement. Do not pay attention to the red lights when positioning the instrument.

4) Put the knob is in the PC position. Turn off the instrument. The instrument should be in the PC position before turning it off, otherwise data may be lost.

2. Downloading the data

Install appropriate software (provided on a PC diskette, zip disk, or CD) on a PC: 1) copy "bwcc.dll" file in c:\windows\system\; 2) create directory for SIMBAD; and 3) copy diskette files into directory. Software works with windows 3.1, 95, or 98. Check whether the right Com port is used (Com port is set in file "simbad.ini"). Connect the rs232 cable to the instrument and to the PC. Put the knob in PC position. Turn the instrument on (do not connect the GPS antenna to the instrument). Press the red button to stop the automatic GPS initialization. Run the SIMBAD executable program, and follow instructions on the user-friendly menu. Save the data on a PC diskette or Zip disk and on the computer. Delete the data from the internal memory. Turn off the instrument.

3. Charging the batteries

After use, turn off the instrument, secure the instrument, and connect the charging cable to the instrument and to an electric outlet (110V or 220V). The instrument must be turned off for the batteries to charge. Charge the batteries all night, from sunset until the next morning.

4. Cleaning the optics

The SIMBAD exterior optics should be cleaned regularly, typically before or after each series of measurements (once a day when several series are collected), with non-abrasive paper, mil-Q water, and ethanol. Do not put mil-Q and ethanol directly on the optics, because it may leak into the internal optics, but on the non-abrasive paper.

5. Experimental procedures

The SIMBAD measurements should be made during daytime, when the surface is lit by the sun (i.e., sun not obscured by clouds), and outside foam and whitecaps. However, they can also be made in cloudy conditions if a measurement of down welled solar radiation (e.g., PAR) is made concomitantly. In overcast conditions, since skylight is diffuse, the position of the instrument in azimuth with respect to the sun is irrelevant. Ideally, weather permitting, the measurements should be made 1) at each station during daytime (if the ship stops offshore), and 2) while the ship is moving around local noon (time of satellite overpass). The best ship location to make the measurements is the bow. Avoid ship shadows. En route measurements should be made only when there is no risk of wetting the instrument (i.e., in relative calm seas). If seawater gets on the instrument, immediately put the instrument in PC position, turn off the instrument, clean the exterior optics (see above), and dry the instrument. Wait until the instrument is completely dry to turn on the instrument again.

All the lights (yellow and red) may stay on, or blink at the same time when doing measurements. If this happens, it may indicate either that batteries are too low or that the internal memory is saturated (saturation can occur unexpectedly). Connect the instrument to the PC, download the data, and purge the memory. If the lights are still on or blinking, turn off the instrument and charge the batteries. If the problem persists, change the battery.

In humid environments (e.g., tropical regions), condensation may occur on the optics when the instrument is moved from an air-conditioned lab to the outside. Check the exterior optics and allow some time for condensation to disappear.

After each series of measurements, ancillary data should be acquired and logged on a sheet (do not forget to precise units). They include: date, time, latitude, longitude, cloud cover (fraction) and type, air temperature, relative humidity, surface air pressure, visibility, wind speed and direction, whitecaps (none, low, moderate, or high), swell height, direction, and period, water temperature, and surface chlorophyll (or fluorometer reading). Some of these data may be available from the bridge log. Cloud cover, surface air pressure, and wind speed must be recorded, otherwise the SIMBAD data cannot be processed.

6. Processing the data

This is accomplished by running the PC executable Calc_MarRef_v1.6.exe. (See <http://polaris.ucsd.edu/~simbad/Software.htm> for details.) The code requires, as input, a data file named MarRefFile. An example of input file MarRefFile is given below, with explanation.

SIMBAD03	<i>Name of the Instrument</i>
investigator=Frouin	<i>Name of Operator</i>
affiliation=Scripps	<i>Affiliation of Operator</i>
contact=rfrouin@ucsd.edu	<i>E-mail of Operator</i>
experiment=CALCOFI0010	<i>Name of cruise (e.g., BEAGLE2003-Leg1)</i>
cruise=New Horizon	<i>Name of Research Vessel(i.e., Mirai)</i>
4.0685 2.5435 2.5775 4.6053 8.3231	<i>SEA Calibration Coefficients</i>
12.824 12.894 12.881 12.913 12.577	<i>SUN Calibration Coefficients</i>
CALCOFI0010.scripps	<i>Name of output file</i>
/usr2/people/simbad	<i>Directory of SIMBAD data</i>
3	<i>Nb. of Cases</i>
28665376.003	<i>SEA Filename</i>
28665315.002	<i>SUN Filename</i>
28665201.001	<i>DRK Filename</i>
1019.7 -999.0 1.3 .4 -999.0	<i>Ps(mb), -999.0, Wind(m/s), Cloud Frac., -999.0</i>
28665389.003	
28665331.002	
28665462.001	
1019.7 -999.0 1.3 .4 -999.0	
28665401.003	
28665343.002	

28665665.001

1019.7 -999.0 1.3 .4 -999.0

7. Contact

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