# BOTPT Tilt Computations (from LILY data)

1) Read in a LILY data record.
2) If the record contains a "*" after the time-stamp, signifying a non-data record, record it to a separate metadata file, but skip it for this data product and go back to step 1; otherwise, move on to step 3.
3) Retrieve the Date, Time, X-Tilt, Y-Tilt, & Sensor Compass Direction values from the record.
4) Round the Sensor Compass Direction to the nearest integer.
5) Using a sensor-specific look-up table (based on LILY serial number; see Appendix B), retrieve the Corrected Compass Direction, which includes corrections for changing from direction of the negative Y-tilt axis to the positive Y-tilt axis, from CCW to CW azimuth from north, calibration offsets, and magnetic declination for Axial Seamount of 17 degrees east of north.
6) Compute the Resultant Tilt Magnitude value as the square-root of ( X-Tilt^2 + Y-Tilt^2 ). Thus, this value is always positive.
7) Send the X-Tilt, Y-Tilt, & Corrected Compass Direction to the COMPASS SUBROUTINE (see below) for computing the Resultant Tilt Direction value.
8) Write to the L1 BOTTILT data product file:
Date; Time; Corrected Compass Direction (parameter CCMP), Seafloor Tilt Magnitude (parameter TMAG), and Seafloor Tilt Direction (parameter TDIR).
9) Go back to step 1.

COMPASS SUBROUTINE (CS)
This subroutine computes the Resultant Tilt Direction using the X-Tilt Y-Tilt, and the Corrected Compass Direction (CCMP):
CS1) Compute an ANGLE using one of the following cases:
        If X-Tilt = 0 and Y-Tilt > 0, then ANGLE = +90
        If X-Tilt = 0 and Y-Tilt < 0, then ANGLE = -90
        If Y-Tilt = 0, then ANGLE = 0
        else ANGLE = arctan( Y-Tilt/X-Tilt )
CS2) Then compute the Resultant Tilt Direction as follows:
        If X-Tilt > 0 or X-Tilt=0, then
          Resultant Tilt Direction = 90 - ANGLE + CCMP
        Else If X-Tilt < 0, then
          Resultant Tilt Direction = 270 - ANGLE + CCMP
CS3) Apply Modulus 360 to the Resultant Tilt Direction so that it will be between 0-360
        e.g. if Resultant Tilt Direction = 450, it will become 90.
CS4) Return the Resultant Tilt Direction value to the main program.