Supplement 3

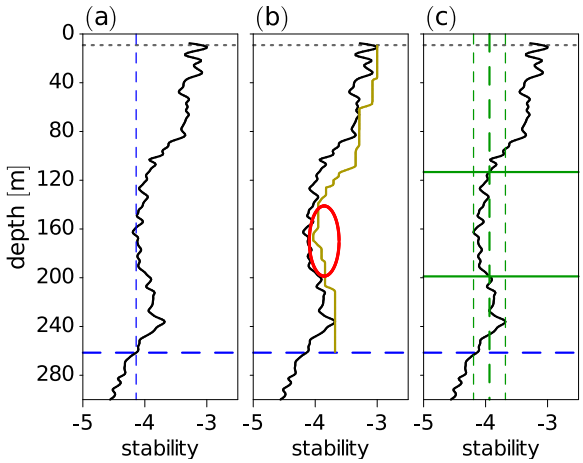

Figure S3. Example: determining the CHS boundaries and center depth (see Sect. 2.2) based on the stability profile for ITP-33 on 6 September 2010. Corresponding temperature and salinity profiles are shown in Fig. 5f. Please refer to the text below for an explanation of the figure.

First, the base of the halocline is estimated using the stability algorithm as described in Sect. 2.1.3 **(a)**. The thin vertical blue dashed line in (a) indicates the stability threshold for estimating the halocline base (searching upward). The horizontal thick blue dashed line indicates the halocline base and the dotted gray line the SML base (computed as described in Sect. 2.3). Then, between the SML base and the halcoline base, a moving maximum is computed for the stability as described in Sect. 2.2 (brown line in **(b)**). The first condition for detecting a CHS is met if a minimum is found above the halocline base between two stability maxima based on the moving maximum profile (red circle). This implies that the distance between the deeper stability maximum and the first upper occurrence of that same stability value must be at least 50 m. An additional condition for identifying the CHS is that the difference of the stability L between the lower stability maximum and the local minimum (i.e. the "amplitude" of the minimum) in the CHS is at least 0.2. If these condition are met, we compute the mean (thick dashed vertical green line in **(c)**) of the stability minimum and the deeper stability maximum (thin dashed vertical green lines in (c)). This stability value is used as a threshold to identify the upper and the lower bound of the CHS (horizontal solid green lines in (c)). The center depth of the CHS is defined as the mean depth between the upper and the lower bound (not shown here). The conditions regarding the minimum vertical extent and the amplitude of the stability minimum described above help to minimize the number of false CHS detections.