Revised Depth-Time Equation
for Sippican or TSK
T-7, T-6 and T-4
Expendable Bathythermographs
(XBT's)

by

K.Hanawa, R.Bailey, P.Rual, A.Sy, and M.Szabados

Abstract

A revised depth-time equation for Sippican and Tsurumi-Seiki (TSK) T-7, T-6, and T-4 type expendable bathythermographs (XBT's) is presented based on the results of an internationally co-ordinated set of controlled XBT-CTD comparison experiments. These experiments were designed to resolve the discrepancies in the revised depth-time equations of previous investigators and were geographically distributed over as many different water masses as possible to assess the possible influence that density structure may have on the XBT fall rate.

A newly developed temperature-error-free method is applied to the data-set to obtain depth difference information between the CTD and the uncorrected XBT data. The accuracies in depth were found in general to be outside of the manufacturers' specified accuracies, and appear to be independent of the production batch, density structure of the water column, and type of probe evaluated for the study. For the T-7 type of probe, the mean depth difference was found to be about 26m at 750m, whereas the manufacturers' depth accuracy specification at 750m is only $\pm$15m ($\pm$2% of depth, or $\pm$5m, whichever is the greater).

The revised depth-time equation, which is calculated from the depth difference data by the method of least squares, is given by

$$Z = 6.702t - 0.00228t^2$$

where Z is the real XBT depth in metres at time t in seconds. The revised equation reduces the depth errors to generally within the manufacturers' specified accuracies. An

approximate linear correction formula is determined for correcting depths recorded using the manufacturers' original depth-time equation (z_0), and is given by

$$Z_c = 1.035 \, z_0,$$

where Z_c is the approximate corrected depth.

The relationship between the scatter of the individual quadratic depth-time equation coefficients and the depth error is discussed. It is shown that when the two coefficients have a certain relationship, the depth differences between the respective depth-time equations are small, even if the two coefficients of those equations have apparently very different values.

The ramifications for the world's oceanographic data bases of the need to revise the depth-time equation for Sippican and TSK T-7, T-6, and T-4 probes are discussed.

COOPÉRATION FRANCO-AUSTRALIENNE

Rapport scientifique des projets
TOGA-COARE et TOGA-TAO

Joël PICAUT
Marie-Hélène RADENAC
Gérard ELDIN
Pierre RUAL
Frank BRADLEY
Stuart GODFREY
Gary MEYERS
Neville SMITH
et la participation de
Michael J. MCPHADEN

COOPÉRATION FRANCO-AUSTRALIENNE

Rapport scientifique des projets
TOGA-COARE et TOGA-TAO

* Joël PICAUT
* Marie-Hélène RADENAC
* Gérard ELDIN
* Pierre RUAL
** Frank BRADLEY
*** Stuart GODFREY
*** Gary MEYERS
**** Neville SMITH
·et la participation de
***** Michael J. MCPHADEN

* ORSTOM, Nouméa	** CSIRO, Canberra	*** CSIRO, Hobart
**** BMRC, Melbourne	***** NOAA/PMEL, Seattle	

/Picaut, J.
/Radenac, M. H.
/Eldin, G.
/Rual, P.
Bradley, F.
Godfrey, S.
Meyers, G.
Smith, N.
McPhaden, M.J.

COOPÉRATION FRANCO-AUSTRALIENNE. Rapport scientifique des projets TOGA-COARE et TOGA-TAO

Ø32MILPHY

OCEANOGRAPHIE PHYSIQUE ; COOPERATION SCIENTIFIQUE, FRANCE-AUSTRALIE ; CAMPAGNE OCEANOGRAPHIQUE ; MOUILLAGE ; SALINITE ; TEMPERATURE ; EL NINO / PACIFIQUE TROPICAL OUEST