

SCOR WORKING GROUP 27 (WITH UNESCO)
TIDES OF THE OPEN SEA

Report on 5th Meeting, Brest, France, 16 to 17 September 1974

Members present: D. E. Cartwright (UK), C. G. Dohler (USA), J. L. Hyacinthe (France), W. H. Munk (USA), R. Radok (Australia), T. Teramoto (Japan), S. S. Voit (USSR) and B. D. Zetler (USA).

Schott sent his apology for his inability to attend. Demerliac and Simon of SHOM, Brest, and Le Provost, Grenoble, attended as observers. Zetler acted as Secretary for the meeting.

Cartwright (Chairman) briefly reviewed the present status of Working Group 27 before initiating the task of editing the prepared material for a report on the intercalibration exercise for bottom pressure sensors conducted off Brest in late 1973. The report on the exercise was completed and was to be transmitted to Unesco for publication directly after the meeting.

The report begins with lists of participants and their affiliations, discussion of the objectives of the Working Group, and an account of the principles and organization of the exercise. Then follow sections on instruments and mooring techniques, calibration techniques, brief narratives of cruises, a discussion on the analysis workshop and related matters, analysis of the records obtained in the exercise, and general conclusions.

Various members then reported on recent work and plans for the future. These are summarized:

Munk:

Discussed baroclinic noise as a limit on the accuracy of cotidal and corange charts; described observations of tidal energy at 3, 4, 5, and 6 cpd in the open sea (MODE area) and suggested that these levels of energy are maintained by a balance of input (energy generated in shallow basins propagating into the deep ocean) and dissipation; and computation of tidal currents from pressure gradients in the MODE area including body forces as well as pressure data, sea floor movement (equilibrium earth tides) but not loading tides, and comparisons with observations (barotropic good, baroclinic poor).

Voit:

Presented the USSR tidal analysis of the test data in Workshop 1 (Wormley, Nov. 1973) as computed using the Darwin method on a Minsk Computer 34.

Radok:

Described his tidal research concerning geophysical processes leading to the formation of a lagoon (The "Coorong") in South Australia at times of extremely high river runoff. Of particular interest was the identification of different water masses using T-S (temperature - salinity) diagrams observed in very shallow water (depth of 1 to 2 feet).

Dohler:

Described a Symposium on open sea tidal measurements, with contributions from participants in the WG 27 intercalibration exercise, and others, in an IEEE meeting in Halifax in August 1974 before a very large and interested audience; summarized Canadian open sea tide programme including 18 submersible tide gauges in the Beaufort Sea for periods of about 6 months at 60 m depth, (due to ice cover, the recovery of these gauges had only just started in September 1974), pressure gauges deployed on sea mounts off Vancouver for 2 months at 60-70 meter depths (2 already retrieved) and future plans for similar array deployments.

Cartwright:

Described an array of bottom tide gauges in the Shetland region; analysis of detailed records to study seiche showed peaks of energy at harmonics of the M_2 tide with a very unusual high peak of energy at the 6th harmonic (12 cpd) at the stations nearest the shelf edge, (possibly trapped waves).

Hyacinthe:

Described installation of bottom tide gauge in Brest Harbour providing real time information on instrument drift for six months; near-future plans include obtaining six months of observations at the intercalibration site, and a comparative test with the IOS deep gauge.

Teramoto:

(later) submitted a written report on measurements of internal tides recorded by current meters and thermistors at two layers at several points in Uchi'ura Bay, inside Suruga Bay. These are being studied in relation to the conversion of energy from barotropic to baroclinic tides caused by topographical features, which is a subject of continuing interest at the Tokyo Ocean Research Institute.

The members then briefly considered efforts in numerical modelling of global tides. These include studies by Pekeris and Accad (including earth tides). Zahel (preparing a 1° model for Prof. W.J. Pierson of City University, New York in the NASA programme using a full equilibrium tide input furnished by Cartwright), Felsenbaum (Moscow) on a 3-dimensional model, and Hendershott using empirical data at boundaries and the effect of crustal yielding. The consensus was that there were signs of a slowing down in global modelling in the past two years.

The members then considered the future role of the Working Group. At the time of its formation, three principal programmes (to encourage development of deep sea tide instrumentation, optimize analysis procedures, and coordinate effort on the global tide problem) had been accepted as the rationale for organizing the Working Group. Inasmuch as the first two objectives had been successfully completed and the existing membership of the Working Group is not ideal for tackling the third objective, it was decided that a report would be presented at the 1975 IUGG meeting in Grenoble recommending that this Working Group be discontinued. The report will include a summary statement on progress during the period of the Working Group; furthermore, consideration will be given to including in the report recommendations on future areas of research (possibly with new working groups) tentatively including: (a) utilization of measurements of sea surface topography from space (contributing to numerical modelling of tides and geodesy, and requiring 'sea truth' observations), (b) baroclinic tides (with applications to tidal currents, variability - in particular tidal cusps - and tidal energy dissipation, and (c) climatic changes (low frequency pressure variations).

With reference to the problem of establishing some form of international data centre for harmonic constants derived from open sea pressure observations, the Working Group was gratified to receive a report by Dohler that the Canadian tidal organization has been designated to act for the International Hydrographic Bureau as a data centre for all tidal harmonic constants, including those derived from open sea measurements.

Schott, unable to attend the meeting, addressed a communication to the Chairman on proposed research in internal waves, in particular on energy transfer and dissipation. In it, he summarizes recent published research and suggests possible future contributions in this field by the Working Group. His communication will be considered in the preparation of the report of the Working Group to be proposed for adoption at the next meeting in Grenoble, particularly with regard to (b) above.