Northwest Atlantic Fisheries Organization

Serial No. N1192

NAFO SCR Doc. 86/73

SCIENTIFIC COUNCIL MEETING - JUNE 1986

Some Comments on Paper by E. Buch Entitled "Review of the Hydrographic Conditions off West Greenland in 1980-85" (NAFO SCR Doc. 86/48)

by

M. Stein

Institut fur Seefischerei, Palmaille 9
D-2000 Hamburg 50, Federal Republic of Germany

Introduction

In the final paragraphs of his paper, Buch (MS 1986) emphasized that two years in his July temperature series diverge from the Irminger water characteristics ($T \geq 3.5°C$, $S \geq 34.75*10^{-3}$), i.e. 1976 and 1984 (Fig. 17 of his paper). He concluded further that the 1984 anomaly was much stronger than the one observed in 1976. As a possible explanation for this anomaly, he suggested that hydrographic conditions in the West Greenland-Davis Strait region prevented the normal inflow of Irminger water.

The Autumn Data Set

Examination of the autumn data from the Fyllas Bank Standard Station 4 (Stein and Buch, 1985) reveals a slightly different situation with regard to the early 1980's. The available data are not sufficient to test the 1976 autumn situation for the 400-600 m depth range. As a first information on the distribution of water masses at Station 4 west of Fyllas Bank (63°53'N, 53°22'W), the mean T-S diagram in Fig. 1 might be considered. It reveals a straight line extending from the low saline surface water to the more saline Irminger water mass (dashed line at 3.5°C, $34.75*10^{-3}$). The layer of interest within the context of this paper is the 400-600 m depth range. Within this depth range (Fig. 1), the temperature and salinity maxima occurs. Below 600 m, the Irminger water is quite uniform with respect to salinity down to a depth of 800 m.

Within the deep water layer, the year-to-year changes are very low (Fig. 2). They amount to less than 10% for temperature and less than 0.6% for salinity. Whereas seasonal processes play an important role in the upper 200 m, the deepwater layers are sensitive to advective and, to a certain degree, convective processes.

In contrast to Fig. 17 of Buch (MS 1985), Fig. 3 of this paper reveals a completely different mean T-S diagram for the autumn conditions off Fyllas Bank. When considering the autumn situation off West Greenland, it must be borne in mind that the Irminger component of the West Greenland Current is at its maximum influence on the distribution of heat and salt in this current system (Buch, 1982). This has an effect on the haline structure in the core layer of this current component. As is evident in Fig. 3, salinities higher than $34.75*10^{-3}$ prevail throughout the years since 1963. There is no dramatic salinity anomaly within the 400-600 m water layer, as observed by Buch (MS 1986) in the July data set. There was, however, a remarkable decline in temperature in 1983 and 1984 (lower part of Fig. 3 and T-S dots 83 and 84). The autumn data of both years reveal temperatures that were 0.5-0.8°C below normal at the standard depths of 400, 500 and 600 m (Fig. 4). The fact that salinity did not change in this layer leads to the assumption that the autumn data indicate deep convective cooling, starting in the surface layer between 1980 and 1981 (Stein, MS 1986). Whereas a warming of the upper 200 m layer was observed in the 1984 autumn data, the core layer of the Irminger component started warming after 1984. Whereas the 0-200 m layer also indicated negative salinity anomalies which might be due to advection from the East Greenland Current, they were missing in the deep layer.

Conclusions

The July and autumn hydrographic observations indicate that the degree of anomaly decreases from summer to autumn. The 1984 anomaly, as observed during July by Buch (MS 1986) does not persist until autumn. This might reflect either changes in the geographical position of the core of the Irminger component of the West Greenland Current or the result of deep convective cooling due to cooling in the surface layer. The latter explanation corresponds with the fact that warming in the upper 200 m layer started one year before it was observed in the deep layer. This interpretation confirms the assumption of Buch that local hydrographic anomalies and not changes in the Irminger Sea might be responsible for the anomalous situation in the deep water layers off Fyllas Bank (West Greenland).

References

BUCH, E. 1982. Review of oceanographic conditions in Subareas 0 and 1 during the 1970-79 decade. NAFO Sci. Coun. Studies, 5: 43-50.

MS 1986. A review of hydrographic conditions off West Greenland in 1980-1985. NAFO SCR Doc., No. 48, Serial No. N1164, 15 p.

STEIN, M. MS 1986. Again warm water off West Greenland. NAFO SCR Doc., No. 20, Serial No. N1133, 7 p.

STEIN, M., and E. BUCH. 1985. 1983: an unusual year off West Greenland? Arch. Fisch. Wiss., 36: 81-95.

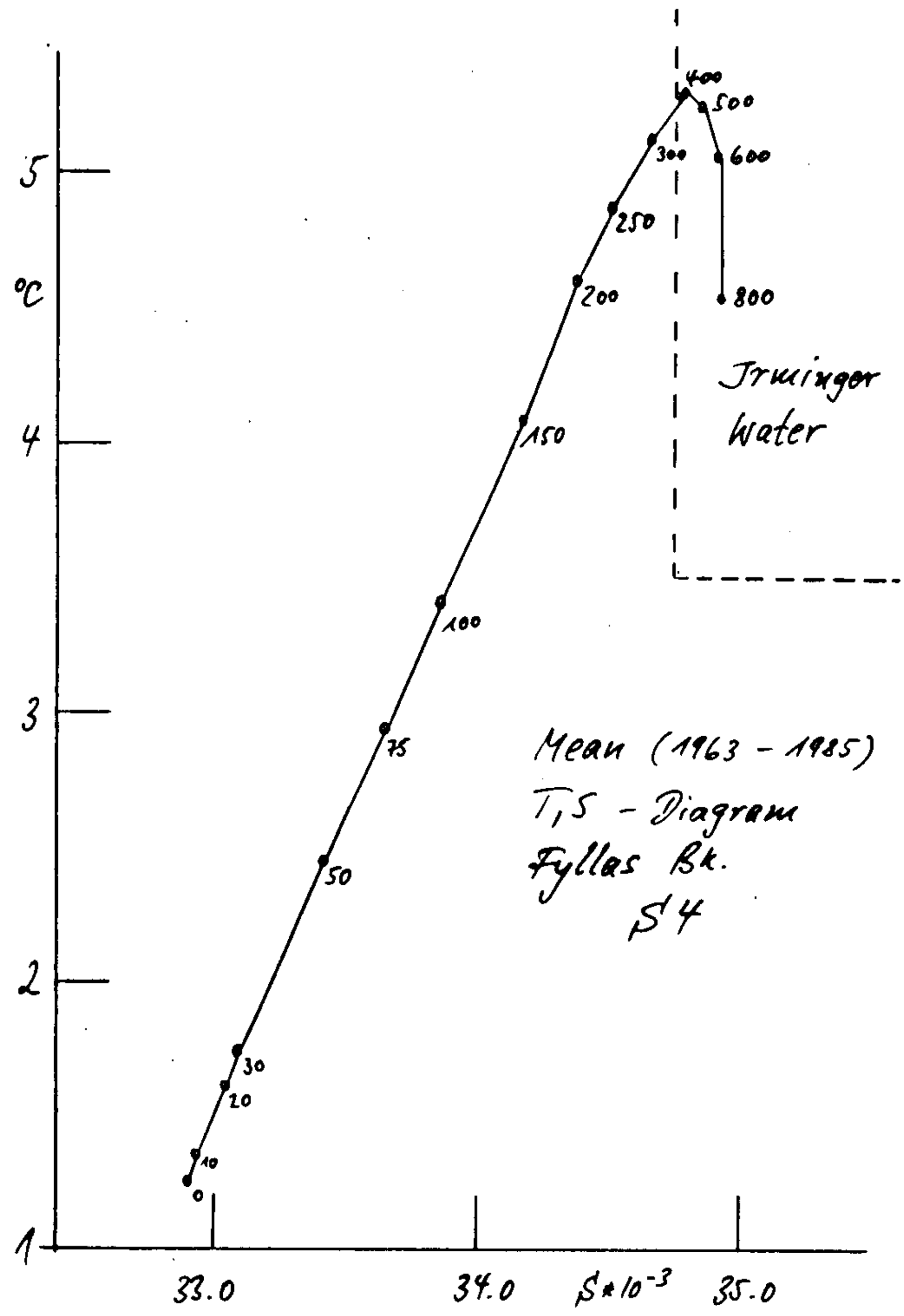

Fig. 1. Mean T-S diagram (1963-1985) for Station 4 off Fyllas Bank (West Greenland).

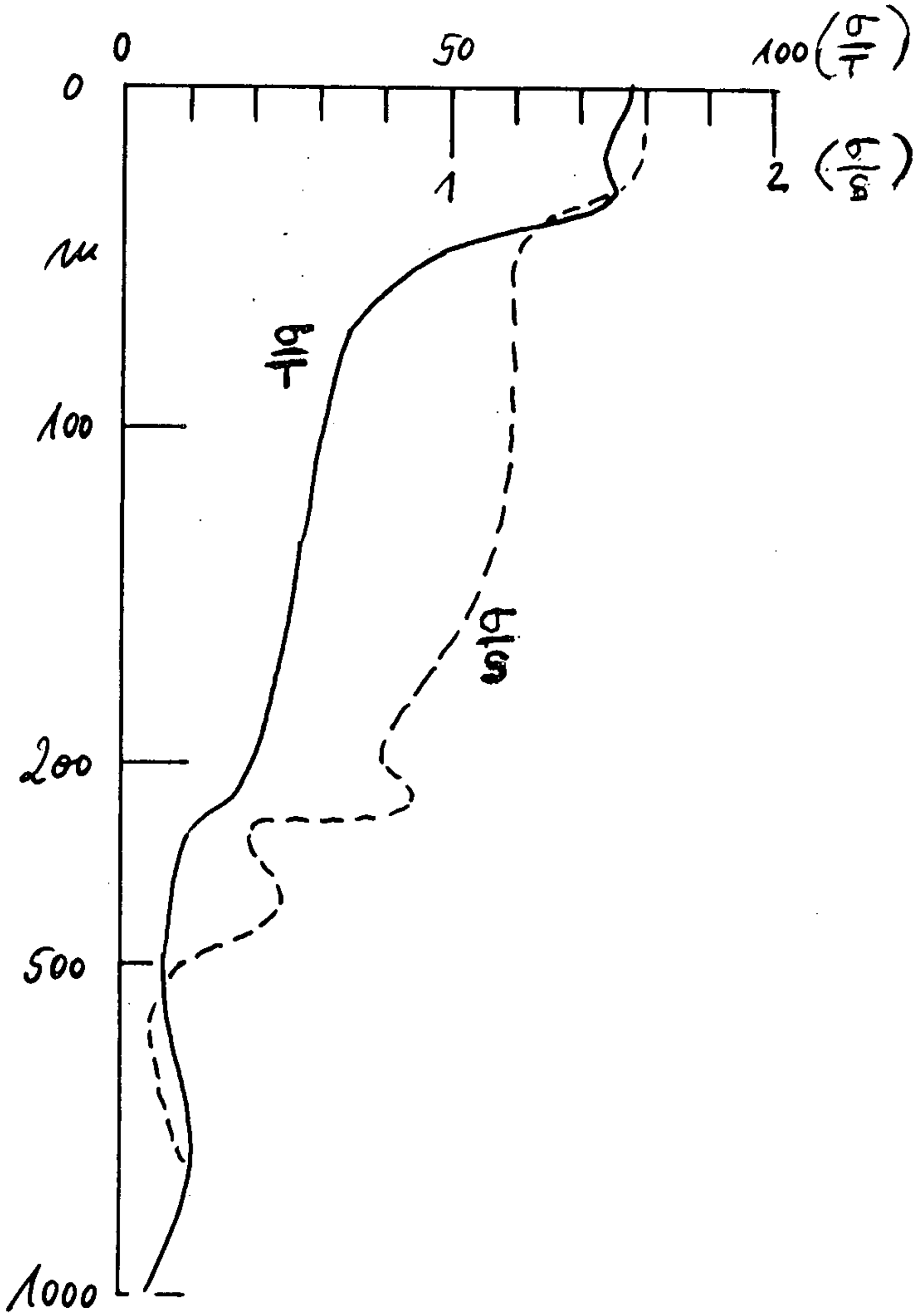

Fig. 2. Ratios of variance (σ) to mean temperature (T) and of variance (σ) to mean salinity.

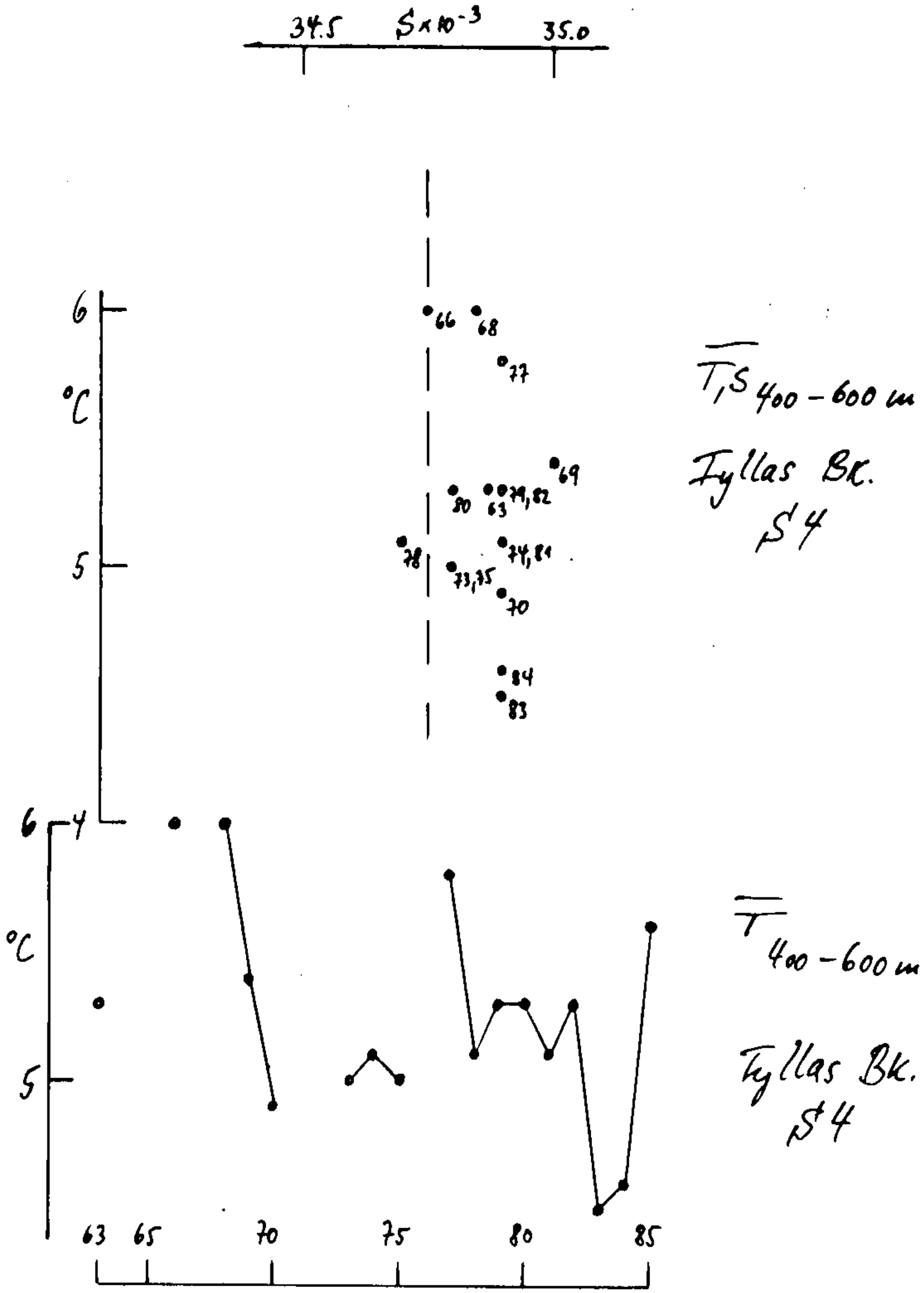

Fig. 3. T-S diagram (upper) and mean temperature (lower) for 400-600 m layer at Station 4 off Fyllas Bank, 1963-85.

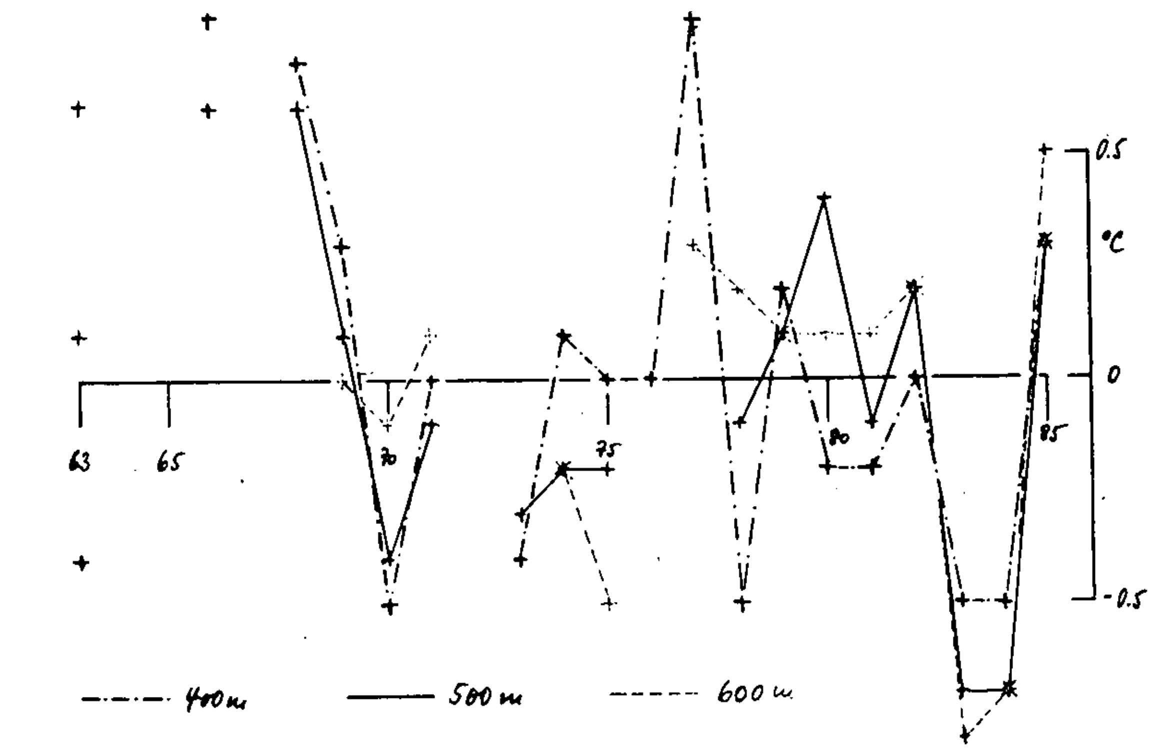

Fig. 4. Autumn temperature anomalies at Station 4 off Fyllas Bank, 1963-85.