

APPENDIX A: FLOE DESCRIPTIONS

The representation scheme for the structure sections is the same as in Figure 16.

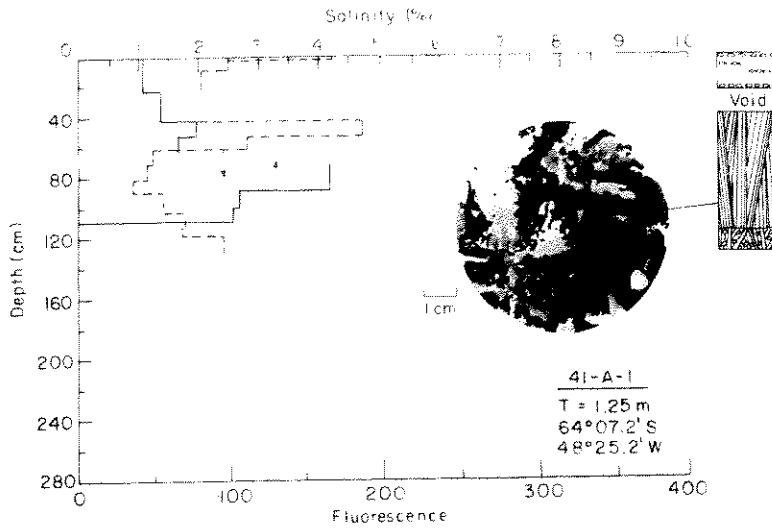


Figure A1. Site 41-A-1.

This first-year floe was characterized by a large void at 25–40 cm. Excluding this void the floe was composed of 66% congelation ice, 21% frazil and 13% of mixed frazil and congelation ice located at the bottom of the floe. The salinity averaged a low 2.0‰. Ice directly beneath the void showed a relatively significant increase in fluorescence to 186 possibly related to an influx of seawater in the vicinity of the void.

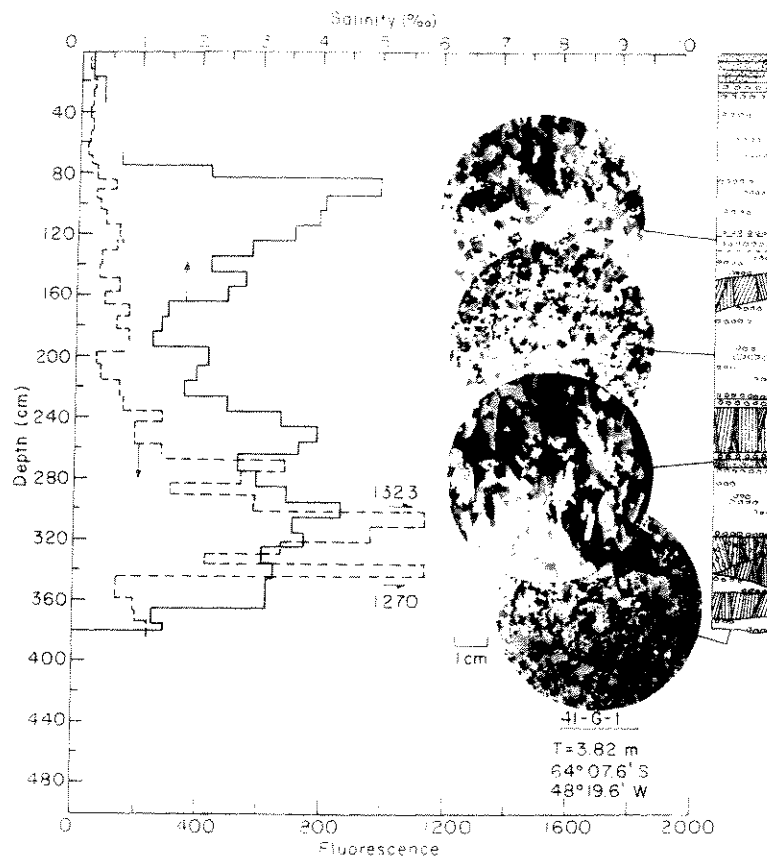


Figure A2. Site 41-G-1.

This multi-year floe contained 25% congelation ice interlayered with frazil ice that made up 70% of the total ice thickness (382 cm). The maximum salinity of 5.0‰ was measured in frazil ice from 80–90 cm, but above this level the salinity did not exceed 1‰ in any of the samples; the average salinity was 2.5‰. Petrographic examinations of thin sections from several levels yielded the following results. The ice at 120 cm had a mosaic-type grain texture composed mainly of frazil grains generally less than 5 mm in diameter, but it also included some larger crystals exhibiting a brine pocket structure more typical of congelation ice. Frazil ice at 195 cm was composed of grains generally smaller than 3 mm. This ice also contained bubbles (possibly air) and brine inclusions. At 264 cm the ice was composed mainly of congelation crystals larger than 10 mm in cross-sectional diameter. Most crystals displayed a well-developed ice plate and brine lamella structure, but the crystals themselves show no azimuthal alignment of their *c*-axes. The relatively bubbly, fine-grained ice at 381 cm was identified as frazil, but it contained a few large crystals exhibiting a brine pocket structure similar to that in the ice at 120 cm. Fluorescence increased perceptibly at about 270 cm, attaining peak values of 1323 in the frazil ice at 302–311 cm and 1270 in congelation ice at 336–343 cm. Stable isotope ($\delta^{18}O$) analyses of samples from the three major frazil layers in 41-G-1 (Table 2) yielded values consistent with crystallization of frazil from normal seawater.

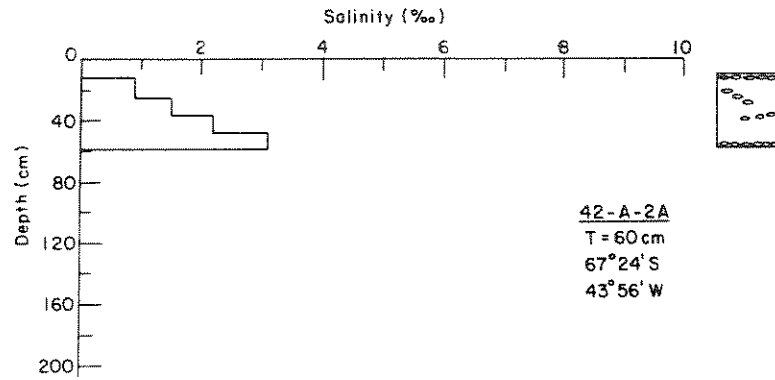


Figure A3. Site 42-A-2A

This 60-cm-thick first-year floe was composed entirely of fine-grained ice identified as frazil. This floe was further characterized by a progressive increase in salinity, which averaged 1.9‰ .

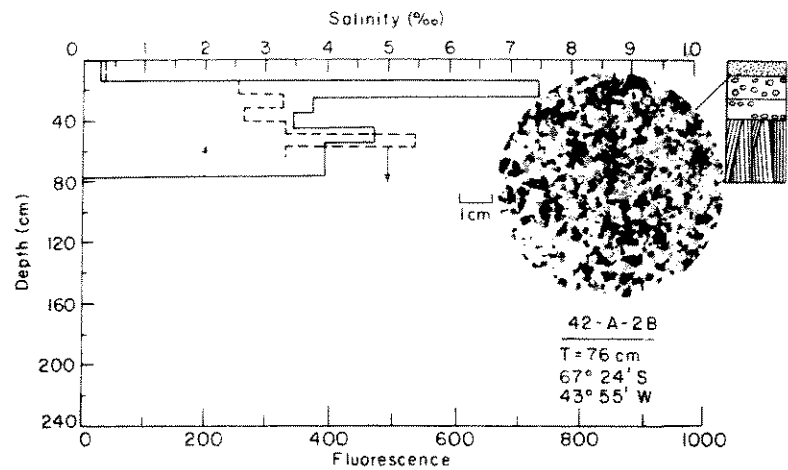


Figure A4. Site 42-A-2B.

This profile was obtained from the same floe as 42-A-2A, but the bottom half of this part of the floe was composed of congelation ice. Samples of this core also proved much saltier, averaging 4.0‰ , compared to less than 2‰ at site 42-A-2A. The peak fluorescence of 546 was recorded in the congelation ice at 60-68 cm.

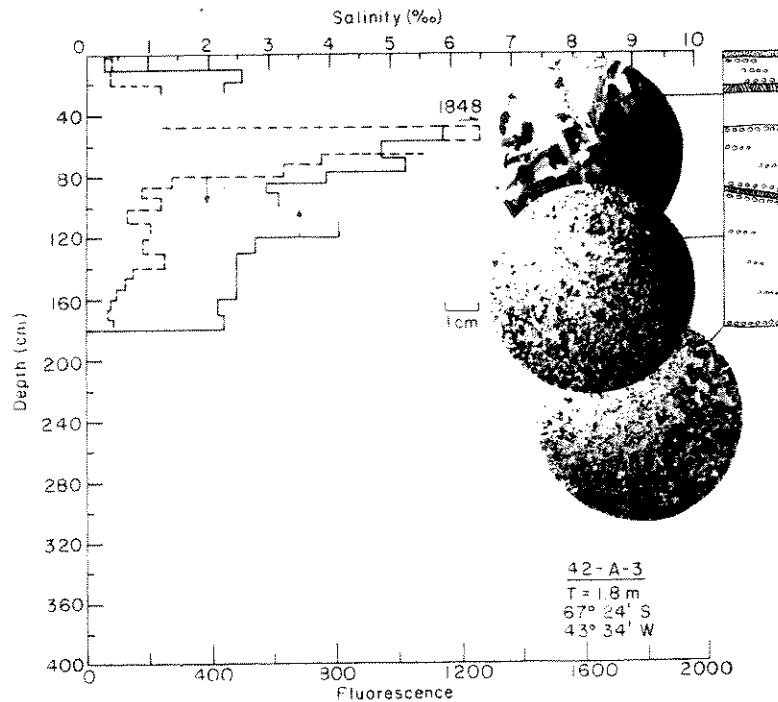


Figure A5. Site 42-A-3.

This 1.8-m-thick first-year floe contained 92% frazil ice and 6% congelation ice, confined to just two layers at ≈ 30 and 100 cm, respectively. The bulk salinity was 3.2‰, with a maximum salinity of 5.9‰ coinciding with the fluorescence maximum of 1848 at 47–57 cm. Horizontal thin section studies yielded the following data. At 28 cm, congelation ice included long-bladed crystals at the transition with the frazil ice. At 118 cm fine-grained frazil exhibited two distinct grain size modes, 1–2 mm and less than 0.5 mm. Fine-grained frazil at 179 cm also exhibited a bimodal size distribution, with the larger grains measuring 2 mm and more in diameter and the smaller grains seldom exceeding 0.3 mm.

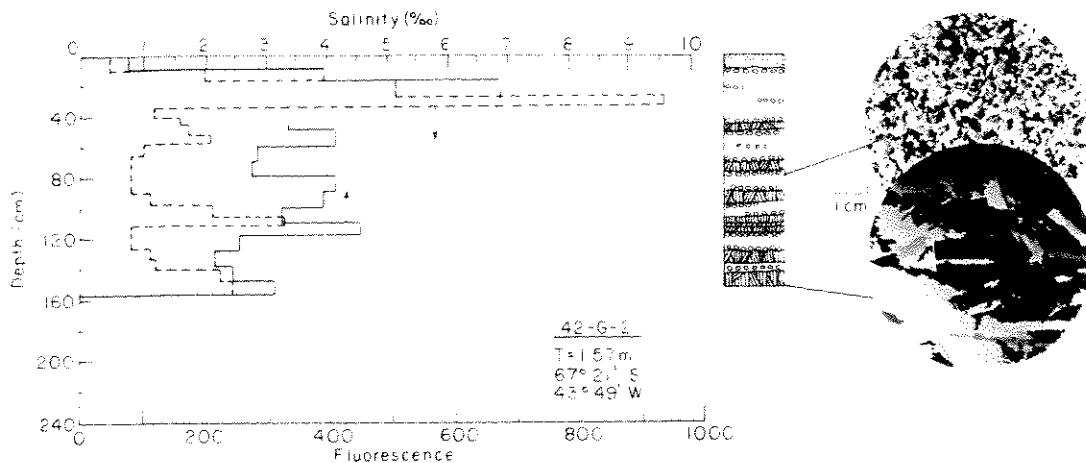


Figure A6. Site 42-G-2.

This 1.57-m-thick first-year floe was composed of a mixture of frazil and congelation ice layers but dominated by frazil ice in a ratio of about 2:1. Seven layers of congelation ice were interspersed with frazil ice; this structure may be related to multiple rafting events. The average salinity of the floe was 3.4‰, with a maximum value of 6.9‰ occurring just above a fluorescence peak of 968 in the frazil ice at 27–34 cm.

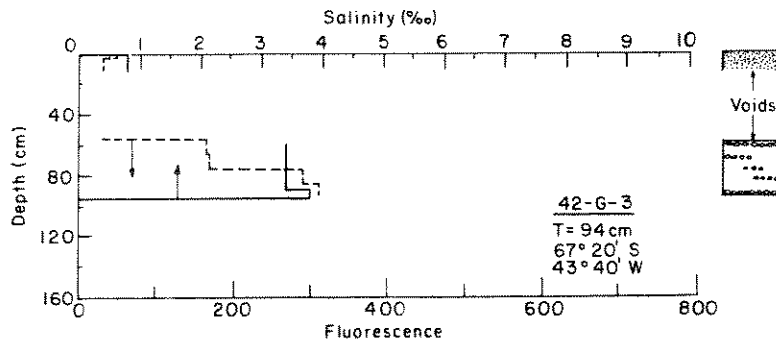


Figure A7. Site 42-G-3.

This was a relatively thin (94-cm) floe from which incomplete core was obtained because of voids in the ice. The cores consisted of snow ice at the top and frazil ice at the bottom. Surface flooding of the floe resulted in the formation of pools of frozen saltwater containing abundant algae. Melted samples from one pool yielded an average salinity of 20‰. In this floe the maximum salinity coincided with the fluorescence peak at the bottom of the floe.

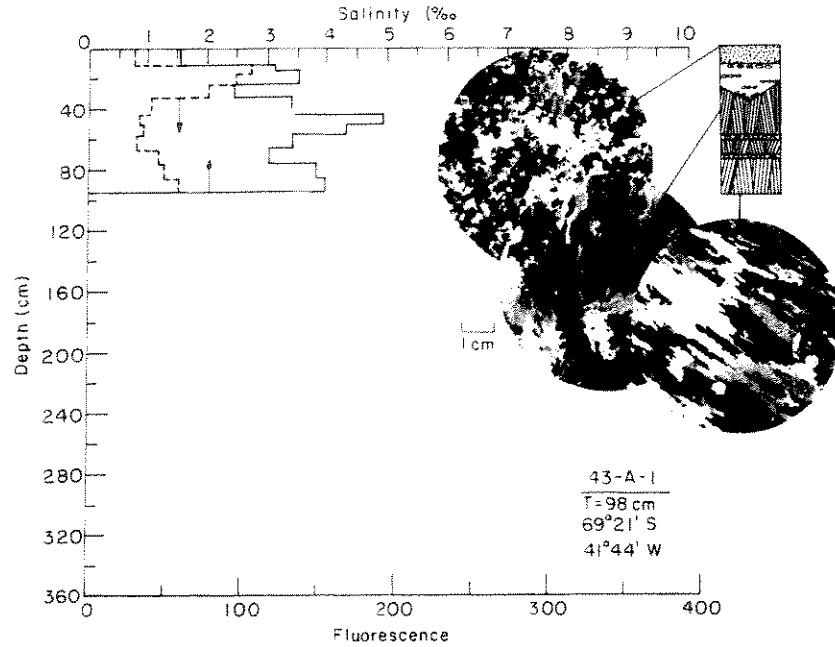


Figure A8. Site 43-A-1.

This floe consisted of thin (98-cm) first-year ice containing 69% con- gelation ice overlain by snow ice (9%) and frazil ice (22%). The c-axes in the thin section of con- gelation ice from the bottom of the floe were very strongly aligned. The average salinity was 3.4‰, with a maximum value of 4.9‰. Fluorescence was unremarkable, with a maximum of 108 at 12-15 cm.

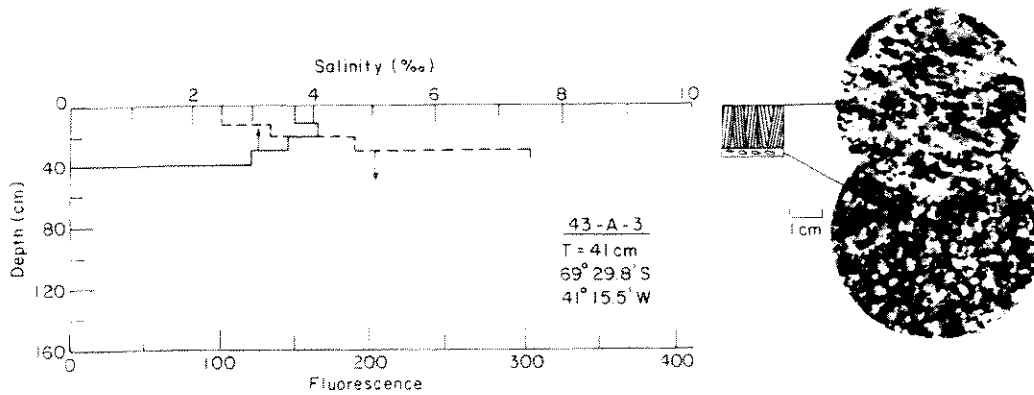


Figure A9. Site 43-A-3.

This 41-cm-thick first-year floe was composed of fine-grained con- gelation ice (82%) underlain by a thin layer of moderately coarse-grained frazil ice exhibiting a fluorescence peak of 304. The average salinity was 3.6‰.

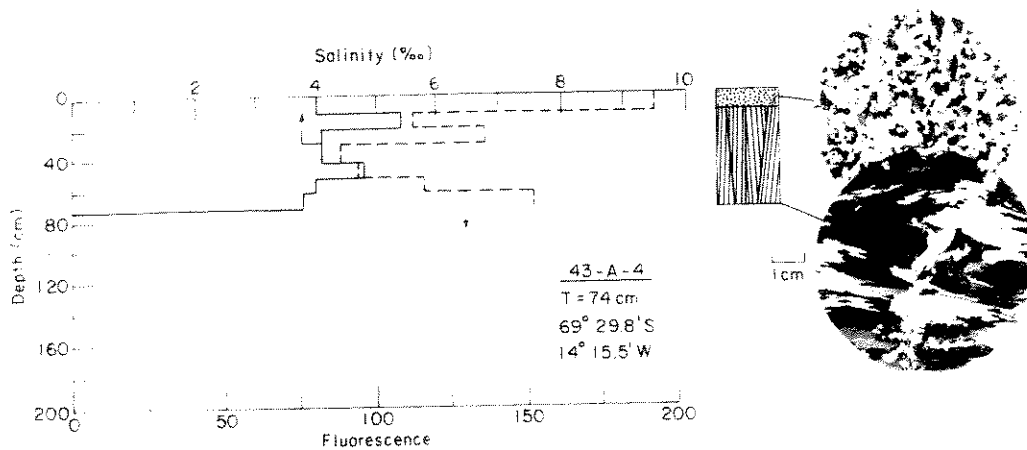


Figure A10. Site 43-A-4.

This 74-cm-long core was obtained from the same floe as 43-A-3, but it lacked the bottom layer of frazil ice and was overlain by a substantial thickness (18%) of bubbly snow ice. The congelation ice was much coarser grained than at site 42-A-3, and the thin section from the bottom displayed signs of c-axis alignment of the crystals. The bulk salinity of 4.3‰ was significantly higher than that at site 43-A-3. The fluorescence was highest in the snow ice (192) but not remarkably so.

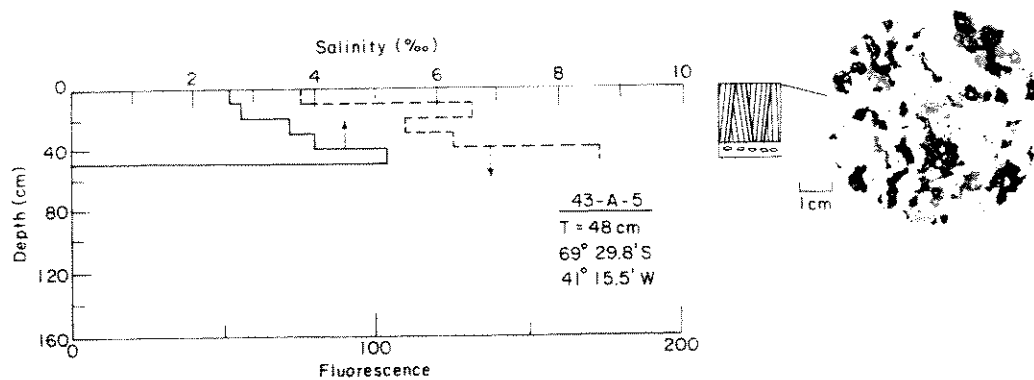


Figure A11. Site 43-A-5.

This sample was also from the same floe as profiles 43-A-3 and 43-A-4, and in terms of its crystalline texture, salinity and fluorescence, this ice is essentially the same as that observed at Site 43-A-3.

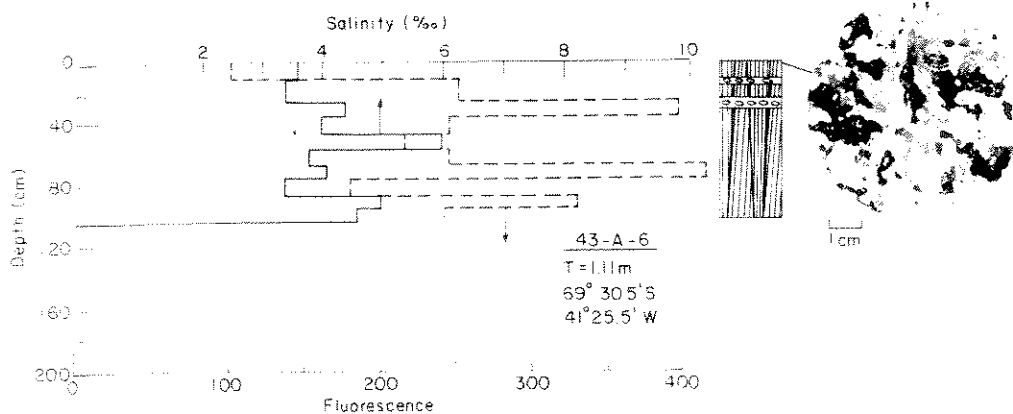


Figure A12. Site 43-A-6.

This first-year ice was 1.11 m thick and was composed principally of congelation ice (85%), with a maximum salinity of 6.0‰ and an average salinity of 4.2‰. Fluorescence maxima of 415 and 396 were observed in congelation and frazil ice, respectively, but were not related in any obvious way to salinity variations.

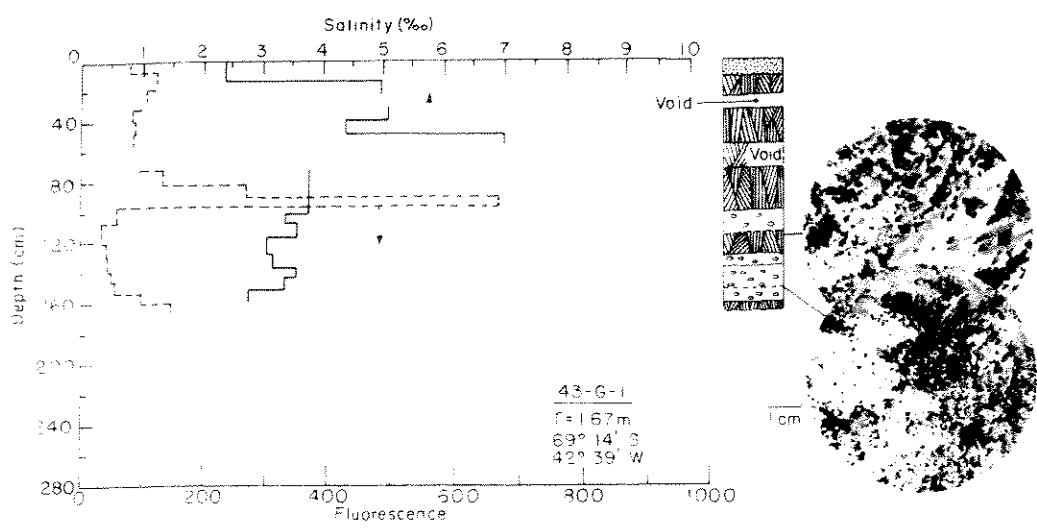


Figure A13. Site 43-G-1.

This first-year floe was 1.67 m thick and was composed of 7% snow ice, 32% frazil ice and 61% congelation ice. A large void, possibly related to brine drainage, was observed in congelation ice at a depth of 25-31 cm. The frazil ice in the bottom half of the floe was generally fine-grained. The alternating structure of frazil and congelation ice in this floe may indicate an origin by multiple rafting. The maximum salinity was 7.0‰, and the bulk salinity was 3.9‰. The peak fluorescence of 693 was in the congelation ice at 90-96 cm, but fluorescence showed no correlation with salinity.

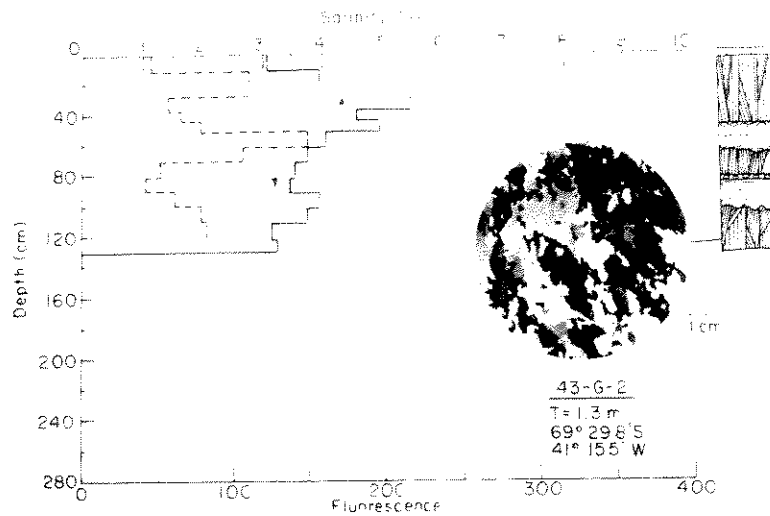


Figure A14. Site 43-G-2.

This first-year floe, measuring 1.3 m at this location, consisted mainly of congelation ice (69%) interspersed with frazil ice (28%) of variable grain size. In this floe and at Site 43-G-3 (a second core from the same floe) alternating frazil and congelation ice may be related to multiple rafting events. The average salinity of the floe at this site was 4.0‰. Fluorescence appeared unremarkable, with a peak value of 152 at 51–61 cm.

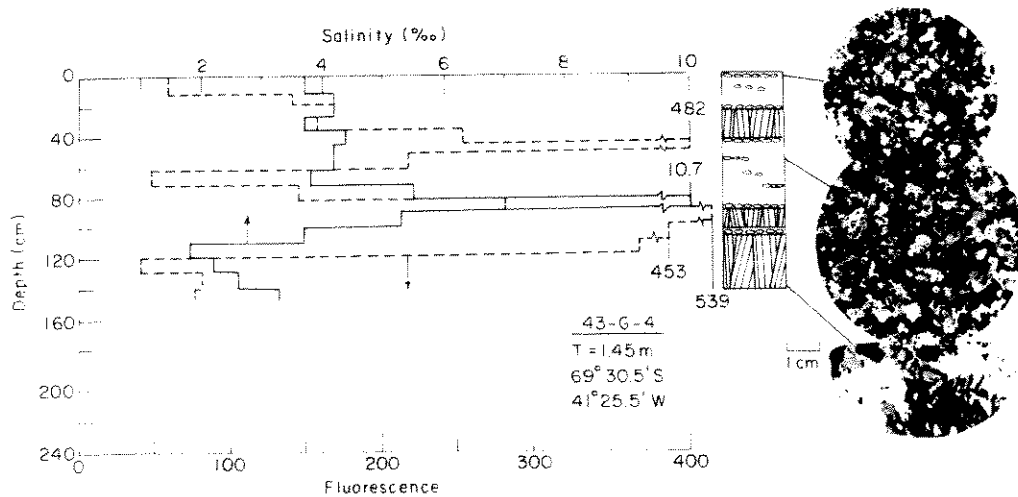


Figure A15. Site 43-G-4.

This first-year floe (1.45 m thick) was composed of approximately equal proportions of frazil ice (dominating the top half of the floe) and congelation ice (dominating the lower half). The maximum salinity of 10.7‰ was at 80–85 cm in the frazil ice located directly on top of congelation ice in which a peak fluorescence of 539 was measured. Several other peaks associated with frazil/congelation ice transitions were also recorded, but they were not related in any systematic way with salinity variations. The average salinity of the floe was 4.2‰. Values of +1.03‰ and +1.24‰ for $\delta^{18}O$ in frazil from 56–60 and 85–90 cm, respectively, indicate crystallization from seawater containing minor amounts of fresh-water.

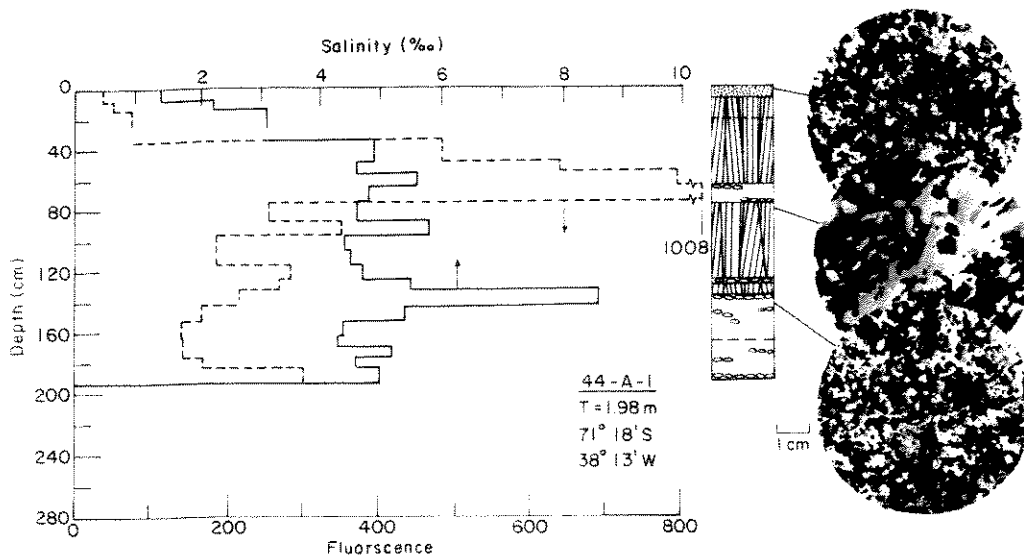


Figure A16. Site 44-A-1.

This first-year floe measured 1.98 m thick and was composed of 4% snow ice, 39% frazil ice (most of which was located at the bottom of the profile) and 57% congelation ice. The average salinity was 4.7‰, and a peak salinity of 8.6‰ was recorded in a sample that spanned ice across the congelation/frazil transition at approximately 140 cm. The peak fluorescence of 1008 was at 75–80 cm in a thin frazil layer directly beneath a thick layer of congelation ice in which fluorescence values were also high for about 30 cm above the transition. A $\delta^{18}O$ analysis of frazil from 67–72 cm is compatible with crystallization from normal seawater. However, a $\delta^{18}O$ value of +0.80‰ at 143–148 cm indicates some freshwater addition to the seawater prior to freezing.

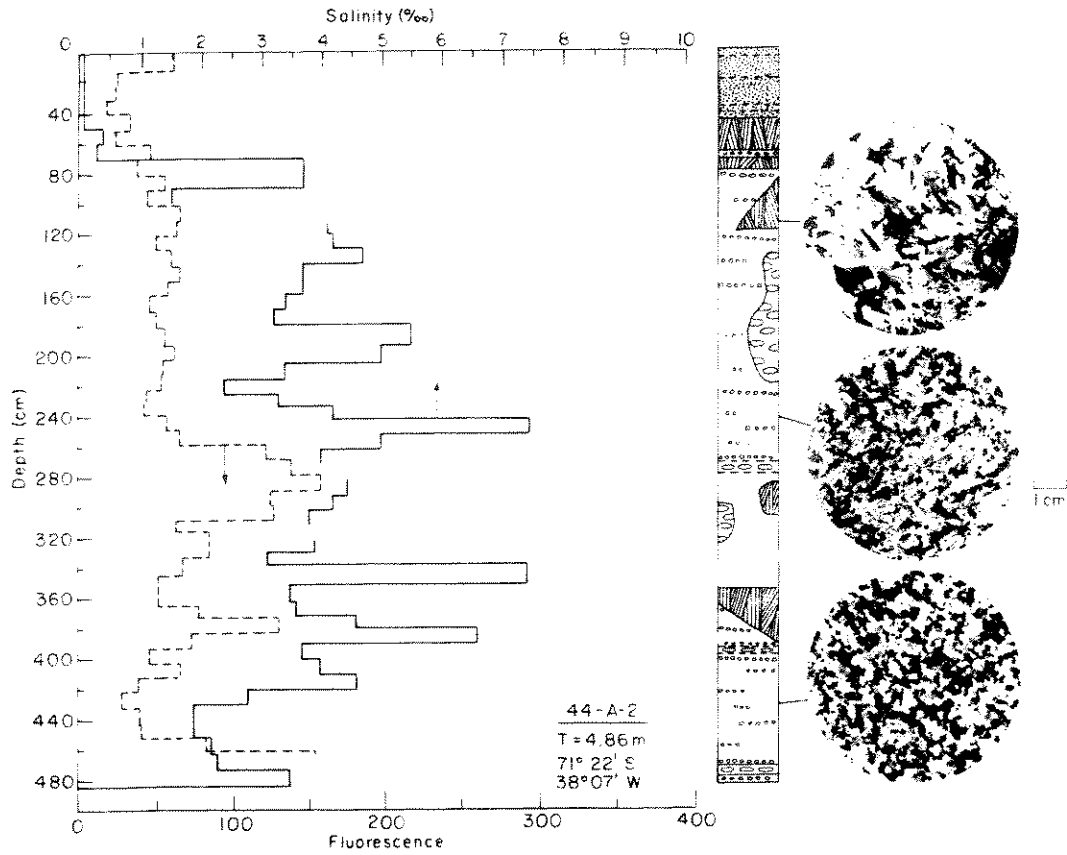


Figure A17. Site 44-A-2.

This 4.86-m-thick multi-year floe was composed principally of frazil ice (75%) overlain by several layers of snow ice representing nearly 10% of the total ice thickness. The fragmented appearance of some of the congelation ice suggests that it was incorporated as blocks during consolidation of the frazil ice. Some frazil ice also appears to have originated by a similar mechanism, particularly the coarse-grained frazil. This floe is also characterized by a highly variable salinity profile, with a maximum of 7.4‰ and an average of 3.4‰. Fluorescence was minimal, with no value exceeding 200 at any depth in the floe. Structurally, this floe was very similar to 42-G-1.

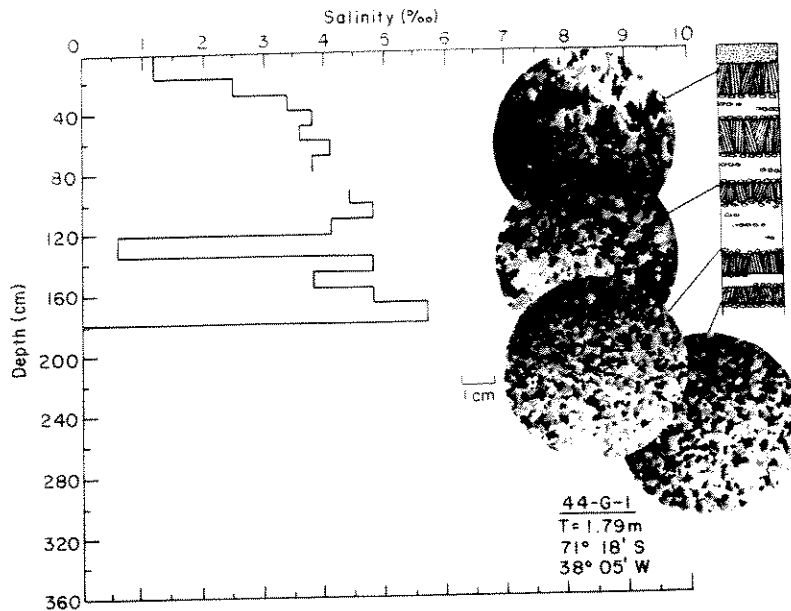


Figure A18. Site 44-G-1.

This is an excellent example of first-year ice in which layers of congelation and frazil ice, possibly related to multiple rafting events, are interspersed at regular intervals throughout the 1.79-m-thick floe. This floe also demonstrates the tendency for cores to break naturally at structural transitions. Horizontal thin sections at 89, 133 and 176 cm all exhibited frazil ice textures, which, by themselves, would have yielded a very misleading estimate of the proportions of ice types in the floe; vertical sectioning showed the floe to be composed of 7% snow ice, 45% frazil ice and 48% congelation ice. The salinity profile slowly increased with depth. A notable exception was the unusually low salinity of 0.7‰ measured in the frazil ice at 120–135 cm; the average salinity was 3.5‰.

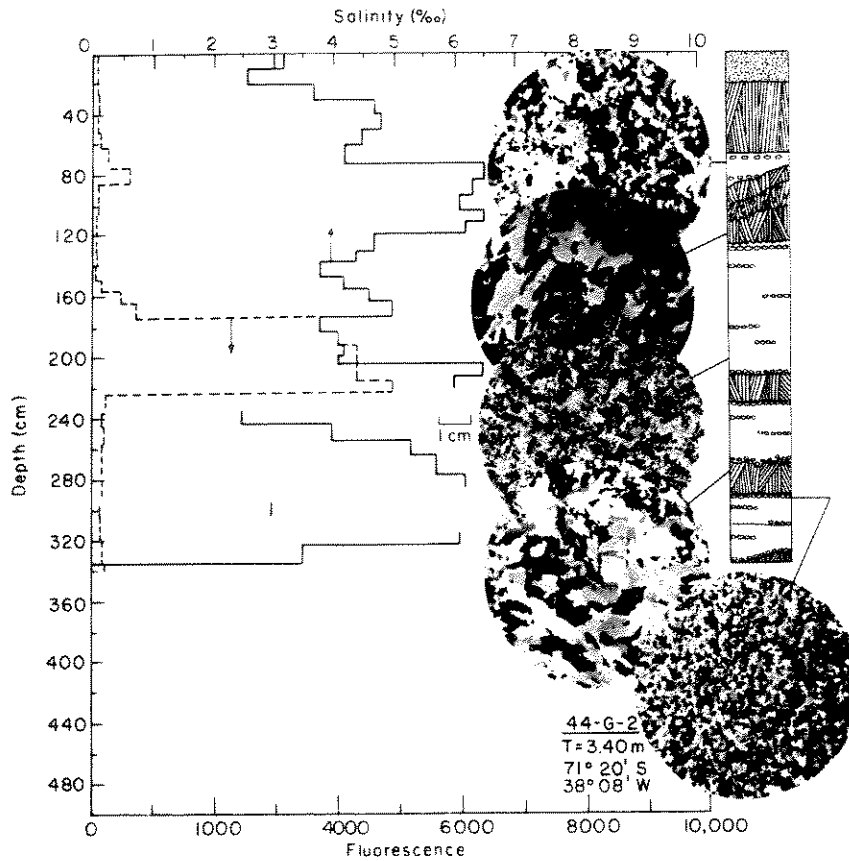


Figure A19. Site 44-G-2.

This multi-year floe, 3.40 m thick, consisted of 56% frazil ice and 36% congelation ice overlain by 8% snow ice and a relatively thick (25 cm) blanket of snow. The frazil ice was characterized by highly variable grain size in the different layers within this floe. The congelation ice textures were similar at all depths, and there was no indication of any significant alignment of the crystallographic *c*-axes. Tilted layers of congelation ice in the upper section of the profile suggest that rafting or overriding of ice had occurred during the early stage of growth of the ice sheet. For a multi-year floe, the ice was appreciably more saline than most, averaging 4.7‰. Very high fluorescence levels, ranging from 3737 to 4949, were recorded between 175 and 225 cm, mainly in frazil ice, though the peak value occurred in the top of the congelation ice immediately underlying the frazil ice. Elsewhere in the core, levels of fluorescence were low, and there was no systematic variation with salinity.

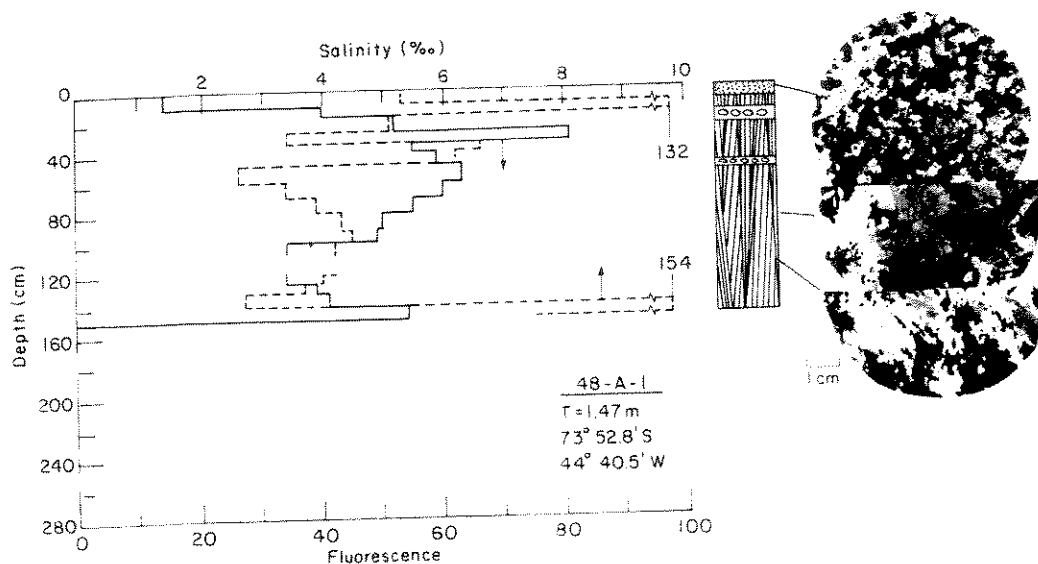


Figure A20. Site 48-A-1.

This 1.47-m-thick first-year floe was composed principally of congelation ice (83%). Frazil ice was restricted to two layers in the upper half of the floe. The bottom half of the core was used for salinity and fluorescence measurements before vertical sectioning could be performed. However, observations on several horizontal sections indicate that congelation ice was the predominant ice type in this floe, and composition percentages were calculated on this assumption. The average salinity was 5.0‰, with a maximum value of 8.1‰ at 30–35 cm. Two fluorescence peaks were measured near the top and at the bottom of the floe.

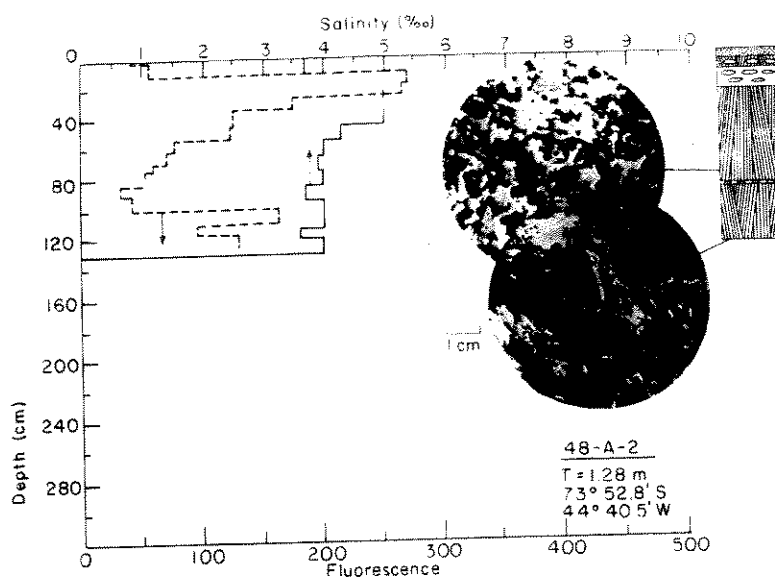


Figure A21. Site 48-A-2.

This relatively thin (1.28-m-thick) first-year floe consisted mainly of congelation ice (80%). The average salinity was 4.3‰. A peak fluorescence of 270 occurred entirely in the layer of coarse-grained frazil overlying the congelation zone.

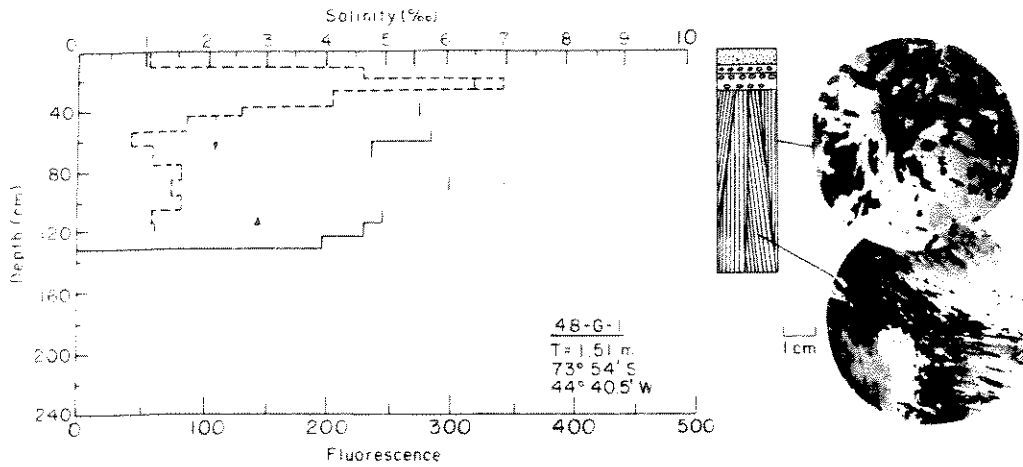


Figure A22. Site 48-G-1.

This was a first-year profile (1.51 m thick) in which congelation ice (81%) was the dominant ice type. The bottom 30 cm was retained for salinity measurements and was not vertically sectioned. However, measurements on horizontal thin sections showed that the bottom ice was composed entirely of congelation crystals. At the top of the core was mixed snow and frazil ice underlain by a frazil ice layer. The plate widths in the congelation ice averaged 0.8 mm, but observations of several thin sections showed no significant alignment of crystallographic c-axes. The fluorescence peak (340) coincided with the frazil ice layer. Salinities varied between 4 and 6‰ in the congelation ice, and the average salinity of the floe at this location was 5.3‰.

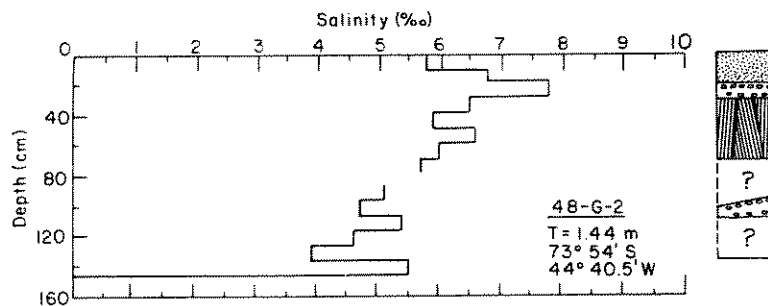


Figure A23. Site 48-G-2.

This profile was obtained from the same floe as 48-G-1; the two cores were drilled less than 2 m apart. Structurally the two cores were very similar in their upper sections. This core was drilled primarily for large-sample salinity measurement, and only the top 74 cm was vertically sectioned, together with one smaller section from near 100 cm, which revealed frazil ice in this part of the profile. The mean salinity was 5.7‰, compared with 5.3‰ for the adjacent profile. The two salinity profiles matched quite closely.

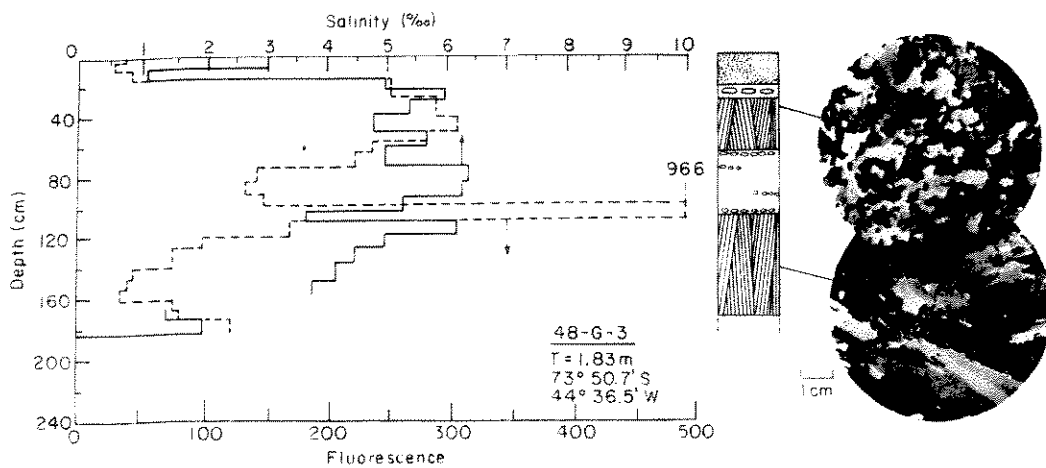


Figure A24. Site 48-G-3.

This moderately thick (1.83 m) first-year floe was composed of 62% congelation ice, 27% frazil ice and an unusually thick layer (11%) of mixed snow and frazil ice at the top of the profile. The bottom 20 cm was not sectioned vertically, but it was assumed to be congelation ice. Salinity varied from 1.1 to 6.3‰, with an average value of 4.5‰. Fluorescence varied greatly throughout the floe, with the peak value of 966 in the frazil ice in contact with congelation ice at 110 cm. Congelation ice in the bottom half of the floe was composed primarily of large, bladed crystals.

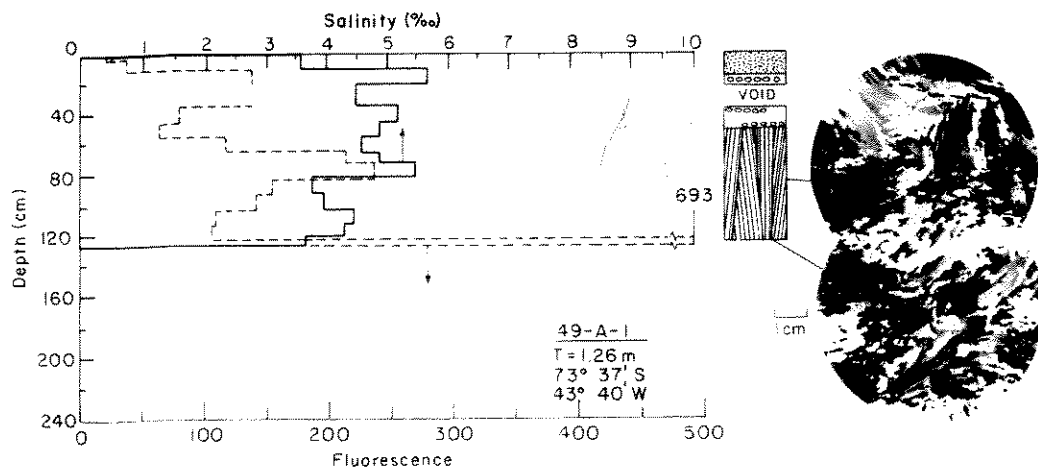


Figure A25. Site 49-A-1.

This first-year floe, 1.26 m thick, was characterized by a void at 22–38 cm. Except for the void, this floe was composed approximately of 66% congelation ice overlain by 14% snow ice and 20% frazil ice. The average salinity was 4.5‰. A peak fluorescence of 693 was measured at the bottom of the floe.

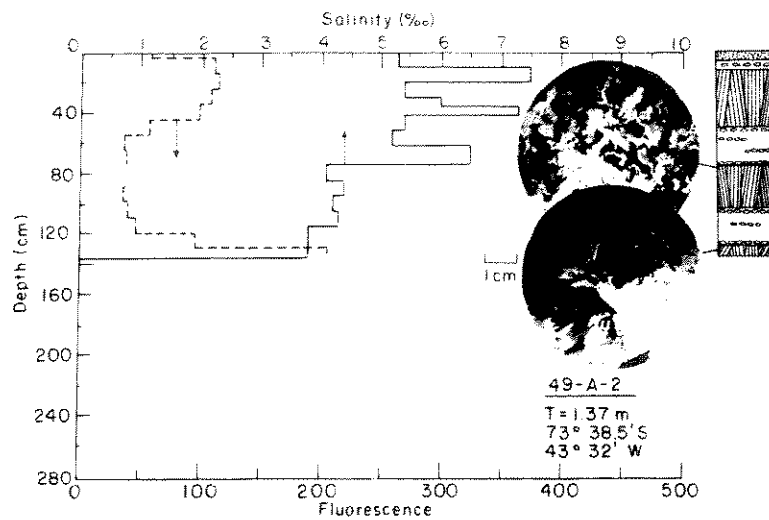


Figure A26. Site 49-A-2.

This first-year 1.37-m-thick floe consisted of congelation ice (55%) interlayered with frazil ice (36%) and overlain by snow ice (9%). There were several salinity peaks in the upper half of the floe; the average salinity was 5.2‰. The maximum fluorescence was in the bottom ice. A $\delta^{18}O$ value for a sample of frazil from 107-114 cm was +1.86‰, indicative of crystallization from normal seawater.

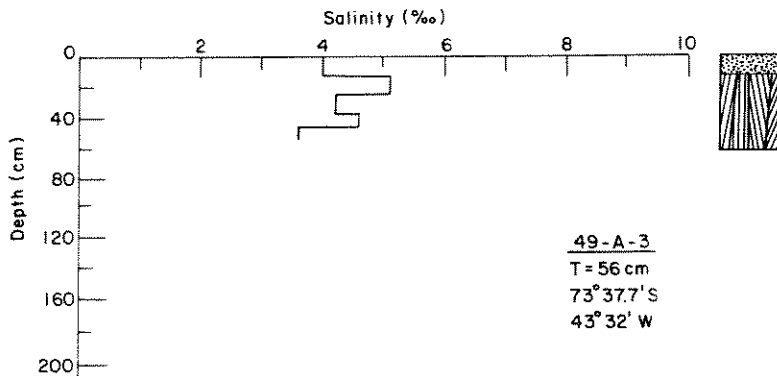


Figure A27. Site 49-A-3.

This 0.56-m first-year ice had a mean salinity of 4.3‰ and was composed mainly of congelation ice (77%) overlain by a mixture of snow and frazil ice.

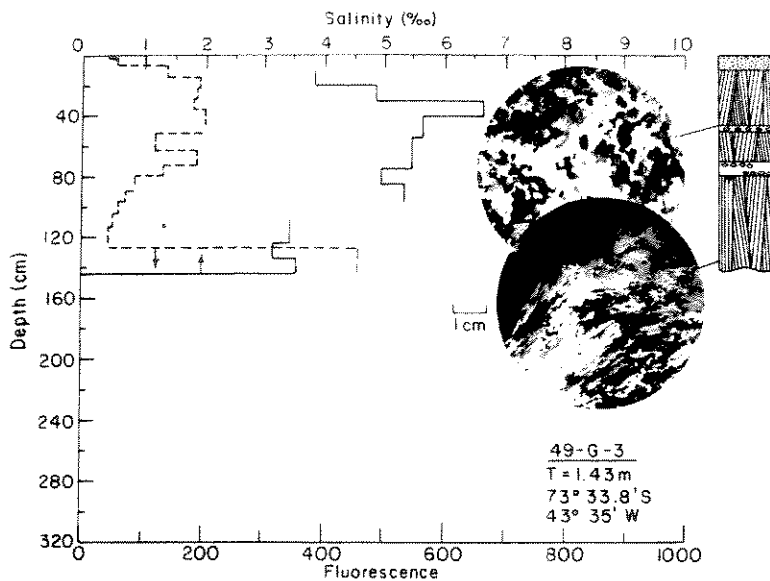


Figure A28. Site 49-G-3.

This first-year ice (1.43 m thick) was dominated by congelation ice (80%) and contained less than 10% frazil ice, confined to two layers near the middle of the section. The thin section from 50 cm included some frazil, but it was composed mainly of fine-grained congelation ice. The section from 135 cm consisted entirely of fibrous-textured congelation ice with moderately aligned c-axes. Some crystals had linear dimensions of several centimeters, and all had brine pockets, with plate spacings averaging 0.7 mm. Much of the core from this location was prominently banded, especially in the zone from 55–92 cm, but the banding was restricted in all cases to the congelation ice. A fluorescence peak of 456 was recorded in ice from near the bottom of the floe. The average salinity was 4.8‰.

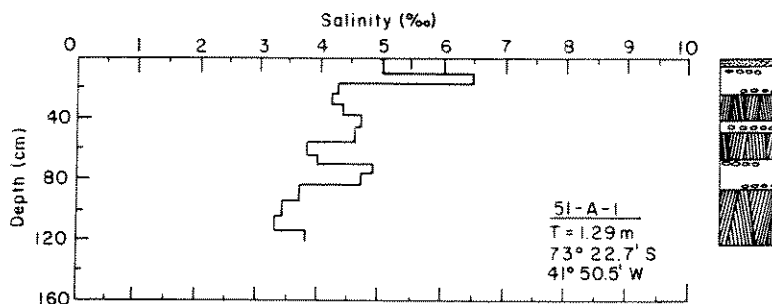


Figure A29. Site 51-A-1.

This first-year floe (1.29 m thick) contained frazil ice (36%) interlayered with congelation ice (61%), possible related to multiple rafting events. A maximum salinity of 6.5‰ was recorded in the frazil ice near the top of the floe; the average salinity was 4.4‰.

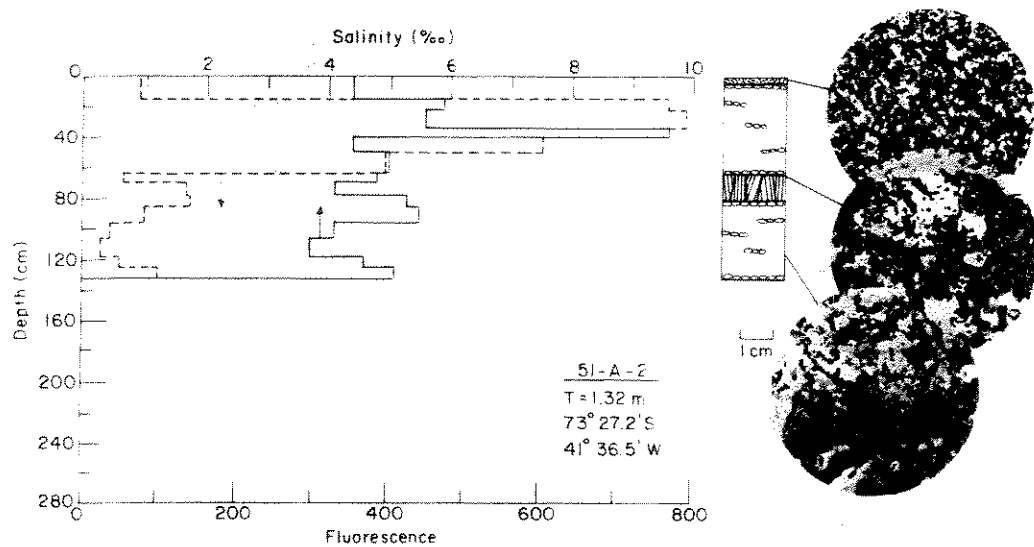


Figure A30. Site 51-A-2.

This 1.32-m-thick first-year ice was composed mainly of frazil ice (83%). Congelation ice (14%) was confined to the middle of the floe. Frazil zones often contained large crystals exhibiting congelation ice characteristics such as brine pockets. The maximum salinity of 9.6‰ was recorded in the frazil ice associated with peak fluorescences of 770–792. The average salinity of the floe was 5.2‰.

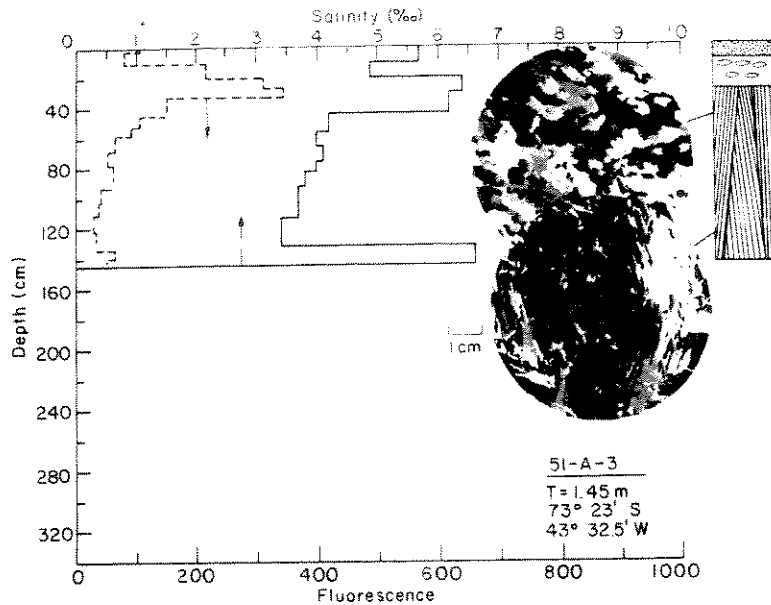


Figure A31. Site 51-A-3.

This first-year, 1.45-m-thick floe was composed predominantly of congelation ice (79%) overlain by moderate- to coarse-grained frazil ice (14%) and mixed snow and frazil ice (7%) in the surface layer. The congelation ice, which contained many semi-transparent bands in the lower half of the floe, had an overall texture that can be best described as fibrous. The plate widths in this ice averaged 0.6 mm, and individual crystals showed a moderately strong alignment of their c-axes, indicating that growth probably occurred either as fast ice or under relatively stationary conditions in the pack ice. The average salinity of the floe was 4.6‰. A peak fluorescence of 344, which also coincided with a peak in salinity (6.2–6.4‰), was recorded in the frazil ice directly above the congelation ice layer.

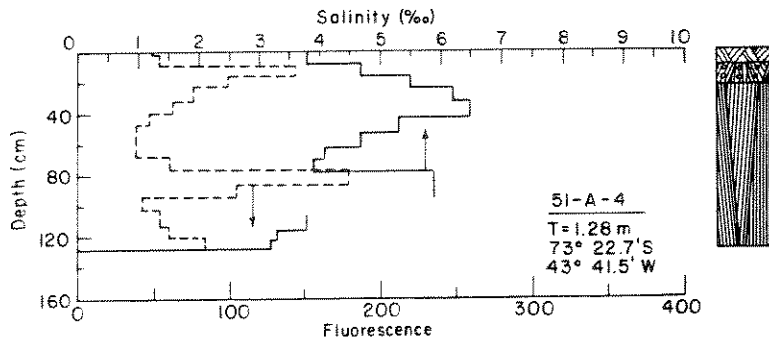


Figure A32. Site 51-A-4.

This first-year 1.28-m-thick floe consisted of 87% congelation ice and 13% mixed congelation and frazil ice. Rhythmic banding occurred throughout the congelation ice. The average salinity of the floe was 4.8‰, and the peak fluorescence of 180 occurred at 77–87 cm in ice with locally high salinity (5.9‰).

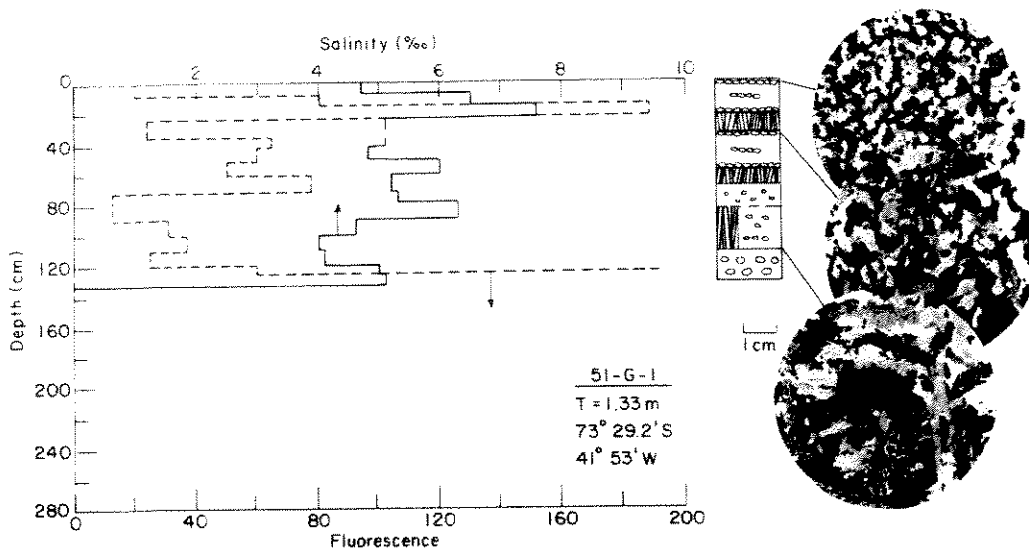


Figure A33. Site 51-G-1.

This first-year 1.33-m-thick ice floe was composed of alternating layers of frazil (72%) and congelation ice (28%) possibly linked to rafting. The average salinity of 5.3‰ was moderately high. The size of frazil grains varied greatly from layer to layer and within layers. The thin section from 118 cm shows large vertically oriented plate-like crystals of congelation ice in sharp contact with fine-grained frazil. This mixed crystal zone extends from 82 to 118 cm. There were two fluorescence peaks, one in frazil in contact with the congelation ice at 24 cm and the second in frazil from near the bottom of the floe.

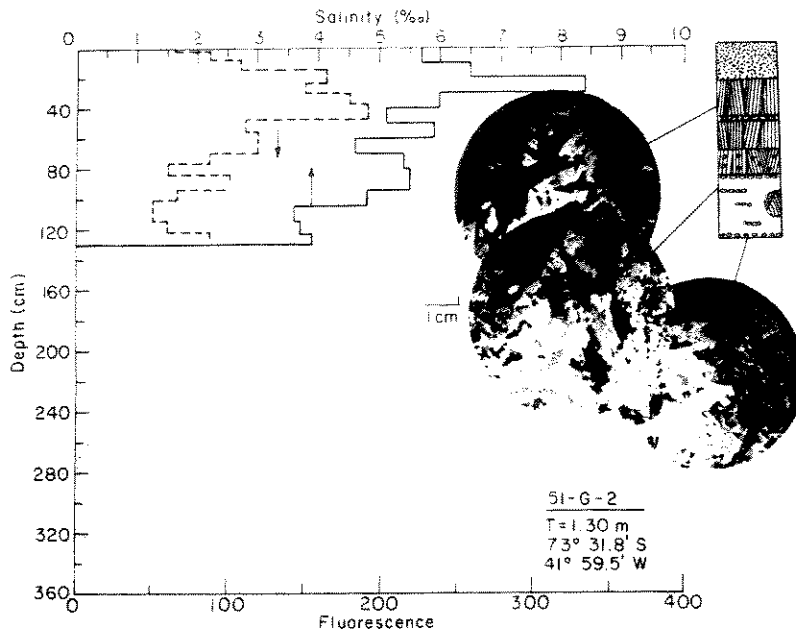


Figure A34. Site 51-G-2.

This first-year 1.30-m-thick floe consisted of 18% snow ice overlying a mixture of frazil and congelation ice in equal proportions (41%). The bottom third of the floe was composed mainly of frazil ice. Relatively large plate spacings of 0.9–1.0 mm were observed in the congelation ice at 38–41 cm. The maximum salinity of 8.4‰ was recorded in the congelation ice directly below the snow ice layer; the average salinity was 5.3‰. The fluorescence did not exceed 200.

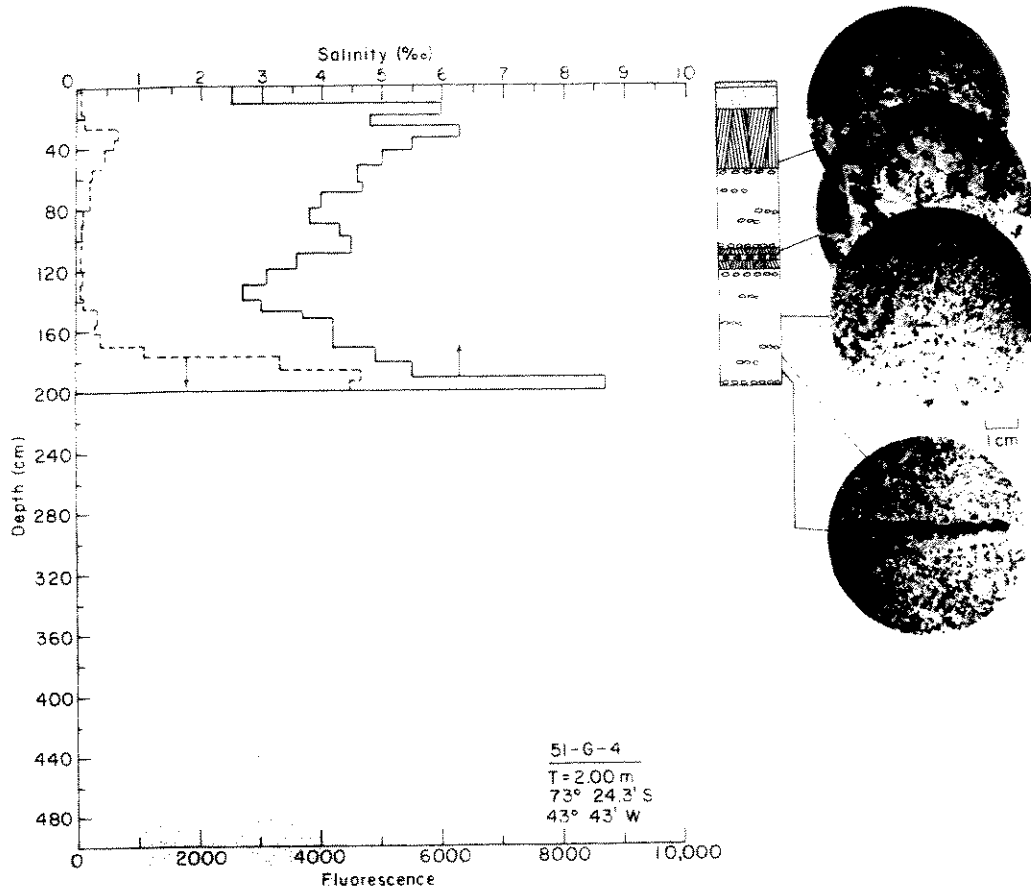


Figure A35. Site 51-G-4.

This first-year floe, 2.00 m thick, was composed of 65% frazil ice, 25% congelation ice and 10% mixed snow and frazil ice at the top of the floe. The average salinity was 4.5‰; the maximum salinity of 8.9‰, recorded in a sample from the bottom of the floe, also coincided with a fluorescence peak that exceeded 4400. The sharp increase in fluorescence beginning at 170 cm corresponded with the appearance of algae bands in the ice.

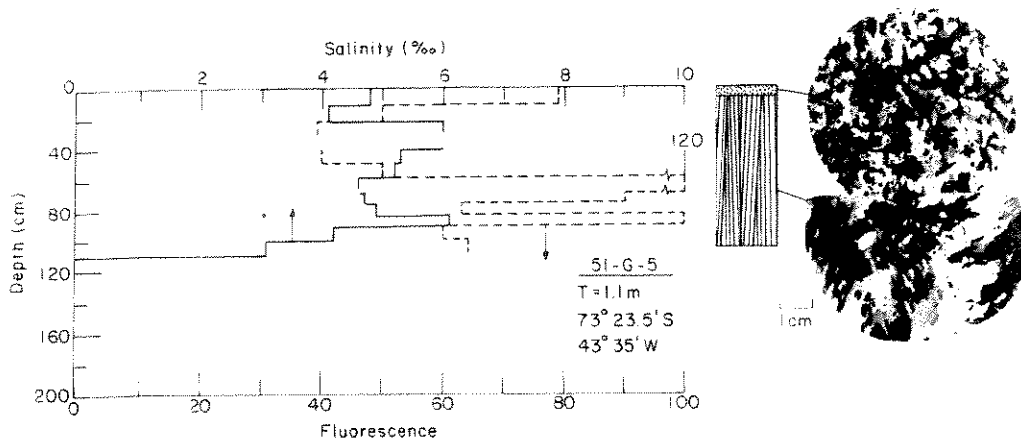


Figure A36. Site 51-G-5.

This relatively thin (1.10 m) first-year floe was composed of 94% congelation ice overlain by a layer of mixed snow and frazil ice (6%). The average salinity was 4.8‰. The fluorescence did not exceed 120.

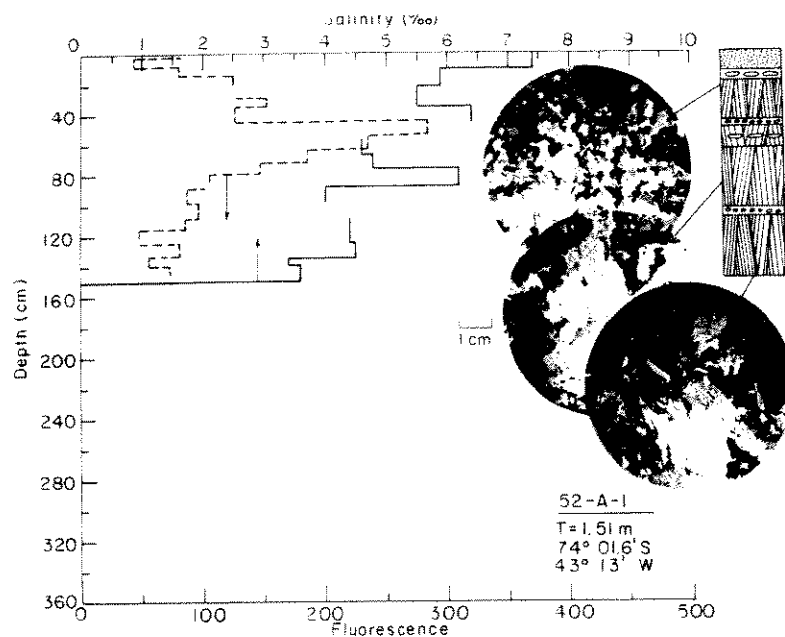


Figure A37. Site 52-A-1.

This first-year ice, 1.51 m thick, consisted predominantly of congelation ice (69%) interspersed with thin layers of frazil ice (22%). A salinity maximum of 7.4‰ was recorded in the mixed snow and frazil ice from the top of the floe; the average salinity was 5.0‰. In congelation ice the plate widths averaged 0.7–0.8 mm. No alignment of crystals was evident.

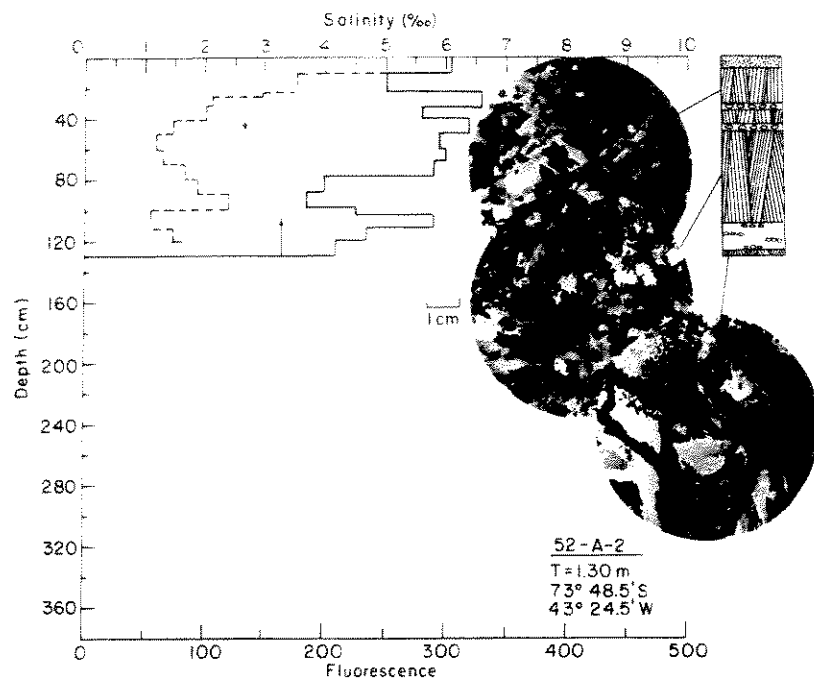


Figure A38. Site 52-A-2.

This floe (1.30 m thick) was very similar to floe 52-A-1 in its salinity profile and structure. The floe salinity averaged 5.3‰, and structurally it was dominated by congelation ice (74%). The peak fluorescence of 288 was recorded in snow and frazil ice from the top of the floe.

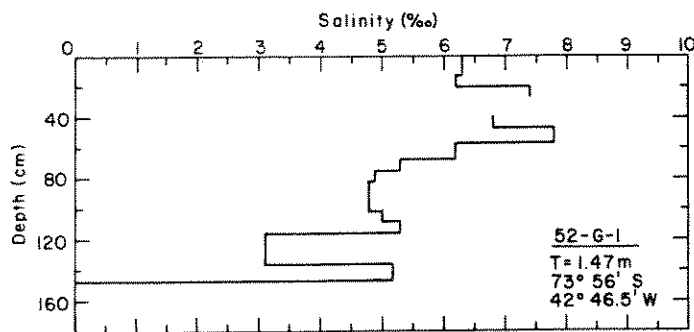


Figure A39. Site 52-G-1.

This is one of three cores drilled less than 4 m apart in a very large first-year floe about 20 km in diameter. This core was used entirely for salinity measurements, which yielded a maximum value of 7.8‰ and an average of 5.5‰.

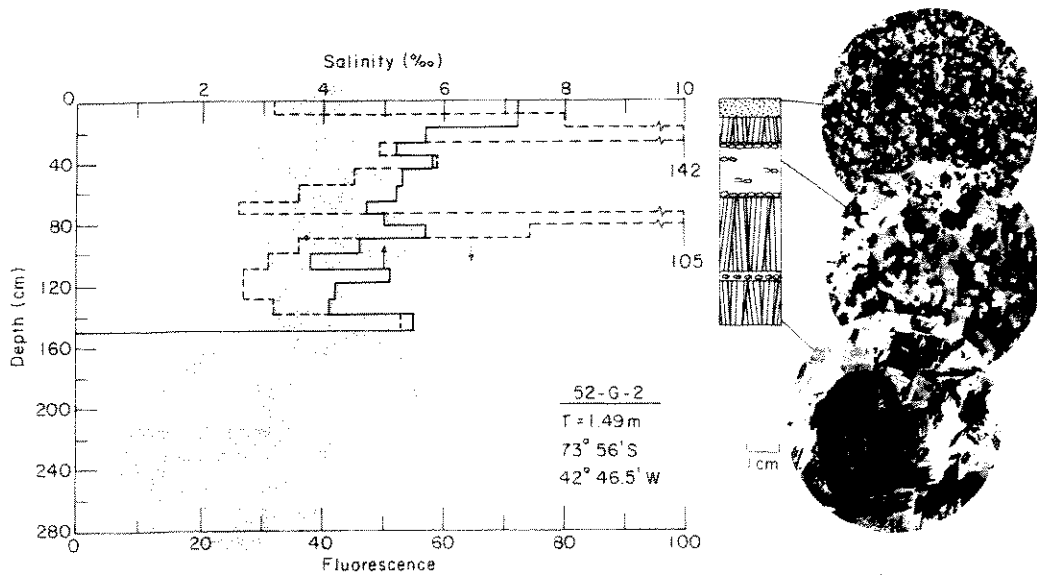


Figure A40. Site 52-G-2.

This core was from the same site as 52-G-1. Its salinity profile was similar to that at 52-G-1. The average salinity was 5.3‰. Structurally the ice consisted of 62% congelation ice and 30% frazil ice overlain by 8% snow and frazil ice. The fluorescence did not exceed 142, and there was no obvious correlation with salinity.

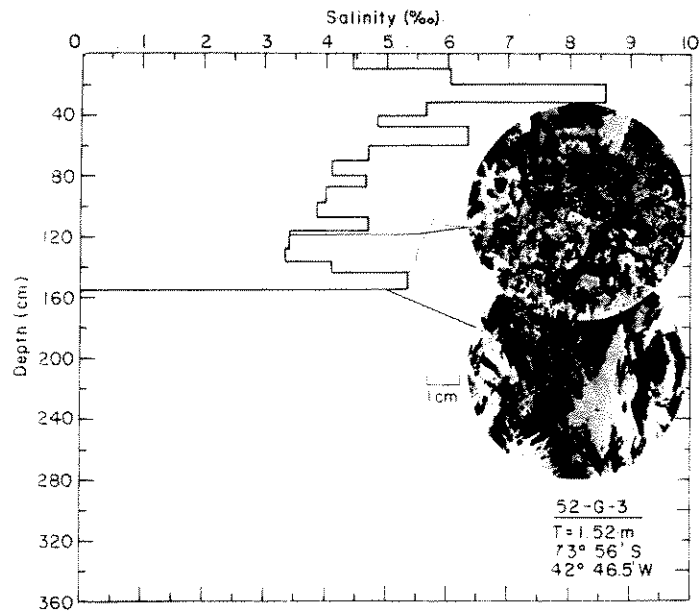


Figure A41. Site 52-G-3.

This was the third of three cores drilled within 4 m of one another. This core was not sectioned vertically, but based on observations of horizontal thin sections, the bottom ice at this location is structurally identical with that from site 52-G-2. Details of the overall salinity profile are similar to those from sites 52-G-1 and 52-G-2, but the average salinity was slightly lower, 4.9‰.

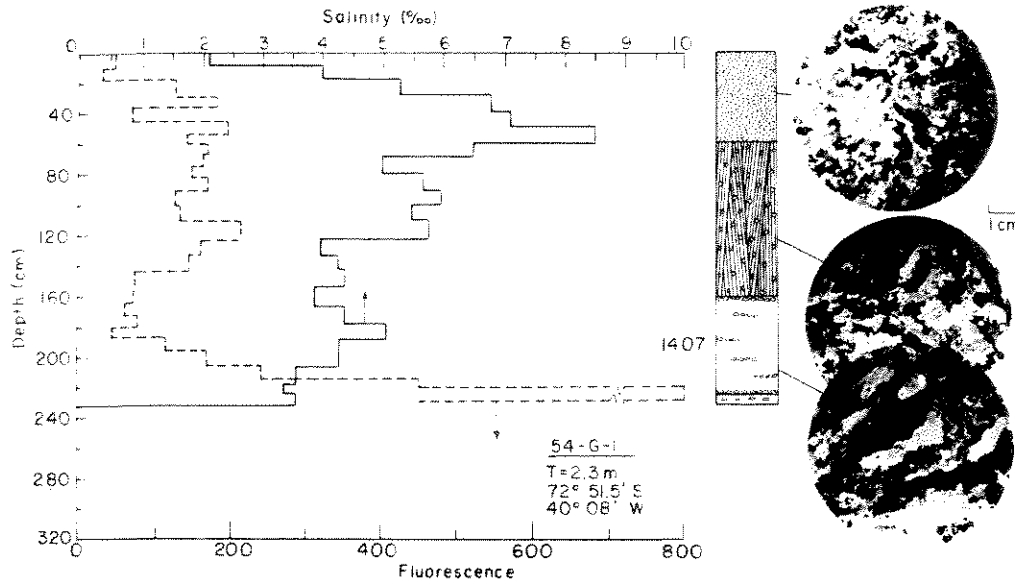


Figure A42. Site 54-G-1.

This thick (2.3 m) first-year floe contained a thicker-than-usual layer of mixed snow and frazil ice, representing 26% of the floe thickness. Congelation ice (45%) containing some frazil crystals appeared to be limited to a single layer beneath the surface layer. The bottom layer of this core was composed mainly of frazil ice, but it included some very large plate-like crystals of ice with plate widths of about 0.8 mm. The top and middle portions of the congelation ice also displayed evidence of widespread drainage of brine. The average floe salinity was 4.8‰; a peak value of 8.5‰ was recorded in the transition ice directly above the top of the congelation ice layer. The maximum fluorescence of 1407 was recorded in a sample from the bottom of the floe. Fluorescence showed no obvious correlation with salinity.

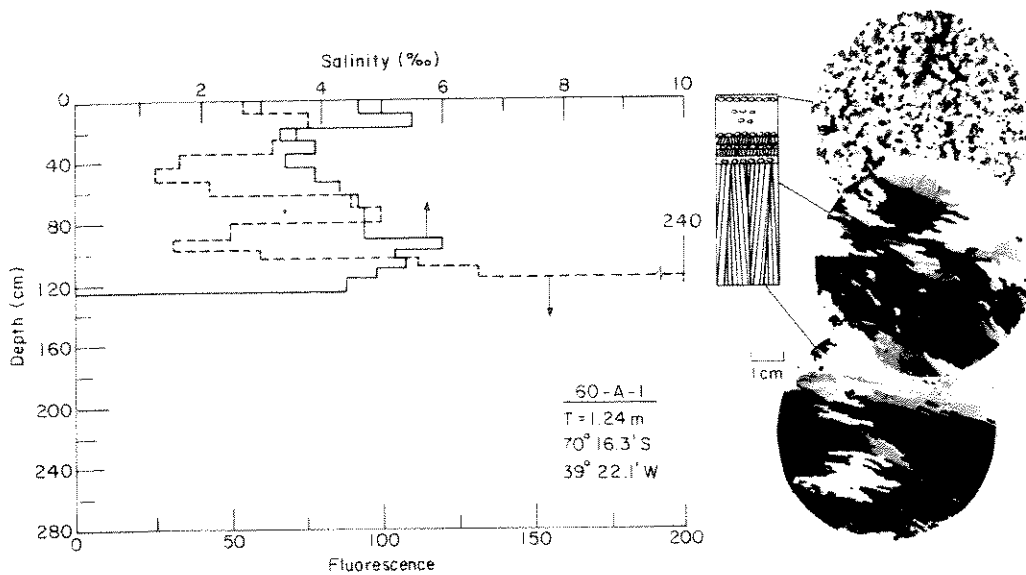


Figure A43. Site 60-A-1.

This first-year floe, 1.24 m thick, consisted of 31% frazil ice and 69% congelation ice. The bottom 60% of the floe is composed of large crystals of congelation ice with very strongly aligned c-axes, indicative of extended growth under stationary pack or fast ice conditions. The average salinity was 4.6‰. The peak fluorescence of 240 was recorded in ice from the bottom of the floe.

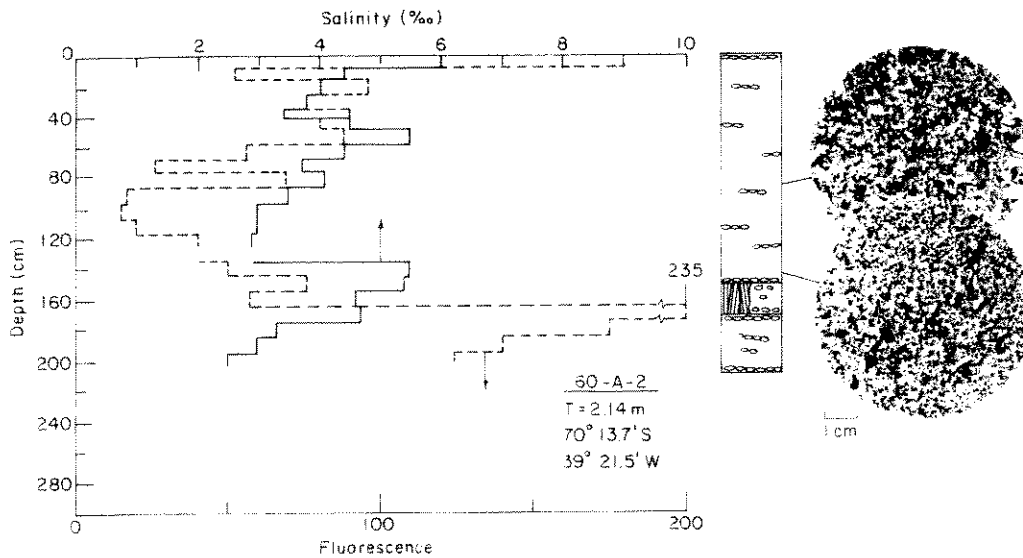


Figure A44. Site 60-A-2.

This first-year ice, 2.14 m thick, consisted of 96% frazil ice of remarkably uniform grain size (2–3 mm in diameter). The 4% of congelation ice is intimately mixed with frazil ice at 150–170 cm. This zone also yielded the maximum fluorescence of 235; a second peak was in ice from the top 10 cm of the floe. The average salinity was 4.1‰. A single $\delta^{18}O$ measurement at 30–35 cm gave a value of $+1.69‰$; proof that the frazil had crystallized in normal seawater.

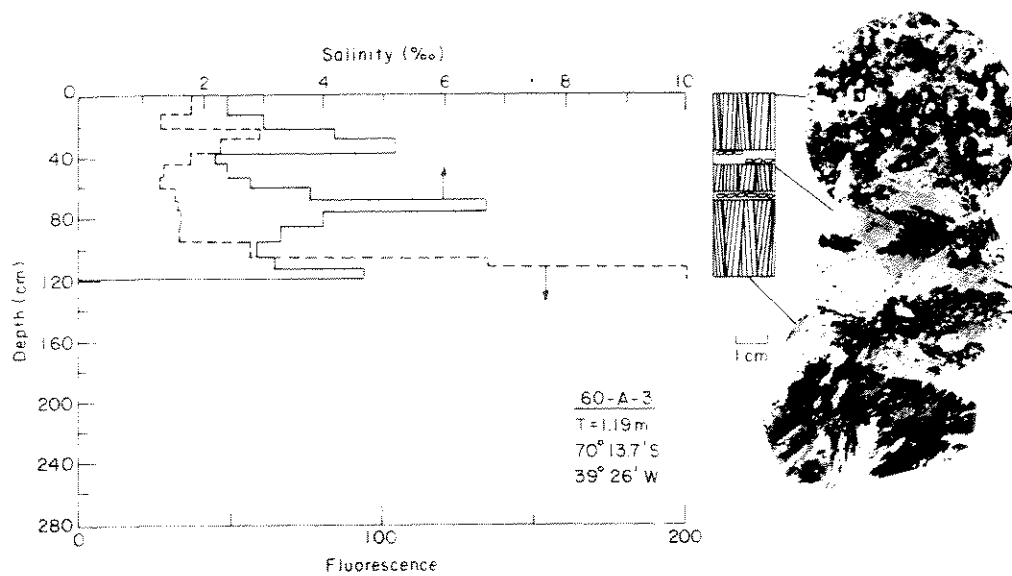


Figure A45. Site 60-A-3.

This first-year floe (1.19 m thick) was composed predominantly of congelation ice (86%) and two thin layers of frazil ice (14%). This floe is unusual because the transition to congelation ice occurred within a centimeter of the top of the ice sheet. The average salinity was 3.6‰. The peak fluorescence (200) was at the bottom of the floe.

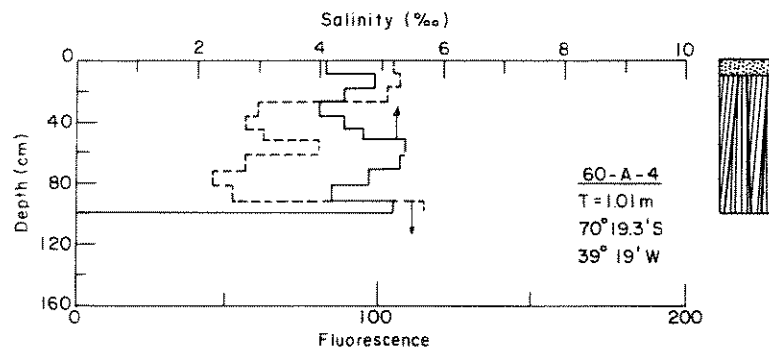


Figure A46. Site 60-A-4.

This 1.01-m-thick, first-year ice consisted predominantly of congelation ice (90%). The average floe salinity was 4.7‰. Fluorescence peaks were measured at the top and bottom of the floe.

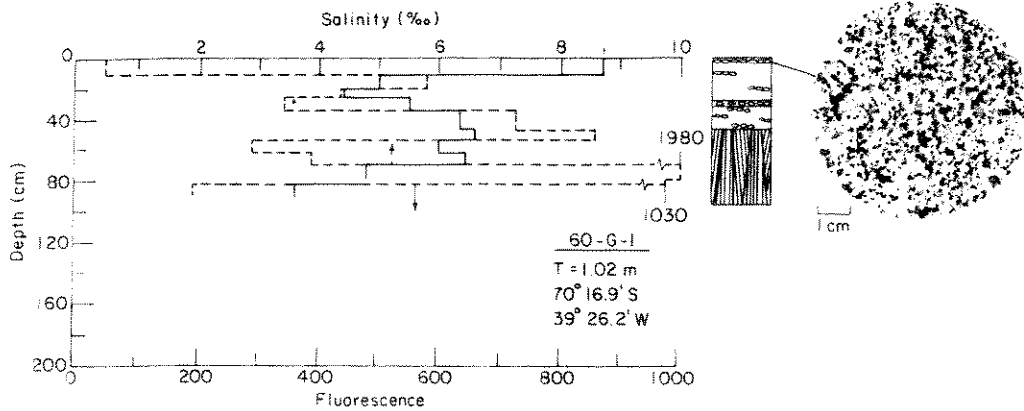


Figure A47. Site 60-G-1.

This 1.02-m-thick, first-year floe consisted of frazil ice overlying congelation ice, each in approximately equal proportions. The average salinity was 5.7‰. The fluorescence peak near the bottom of the floe coincided closely with the occurrence of abundant brown algae in the ice. Two samples of frazil from 11–17 cm and 34–39 cm yielded $\delta^{18}\text{O}$ values of +0.51 and +1.01‰, respectively, indicating very slight mixing with snow during the early stages of formation of this ice.

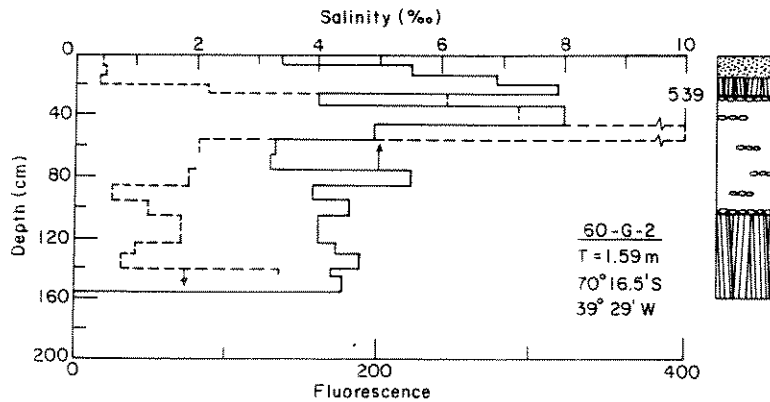


Figure A48. Site 60-G-2.

This first-year ice, measuring 1.59 m thick, consisted of 9% snow and frazil ice and 49% frazil ice located between two layers of congelation ice totaling 42% of the floe thickness. The average salinity was 4.8‰. A maximum salinity of 8.0‰ was recorded in the frazil ice directly above the peak fluorescence of 539.

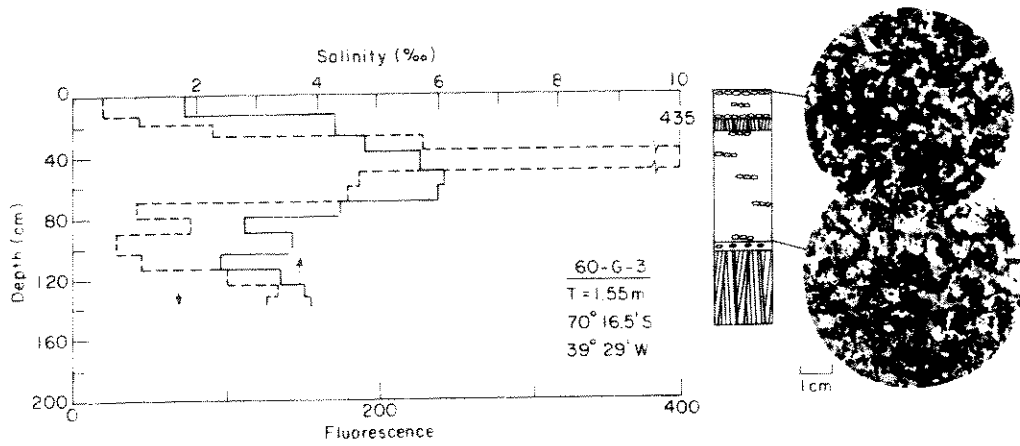


Figure A49. Site 60-G-3.

This first-year, 1.55-m-long core was from the same floe as 60-G-2. Its structural, salinity and fluorescence profiles are practically identical to those of the 60-G-2 core. The only major differences were the absence of snow ice and the increased percentage of frazil ice (63%). Also, fluorescence variations showed a stronger positive correlation with salinity than at site 60-G-2. However, the average salinity was somewhat lower, 4.1‰, compared to 4.8‰ at site 60-G-2.

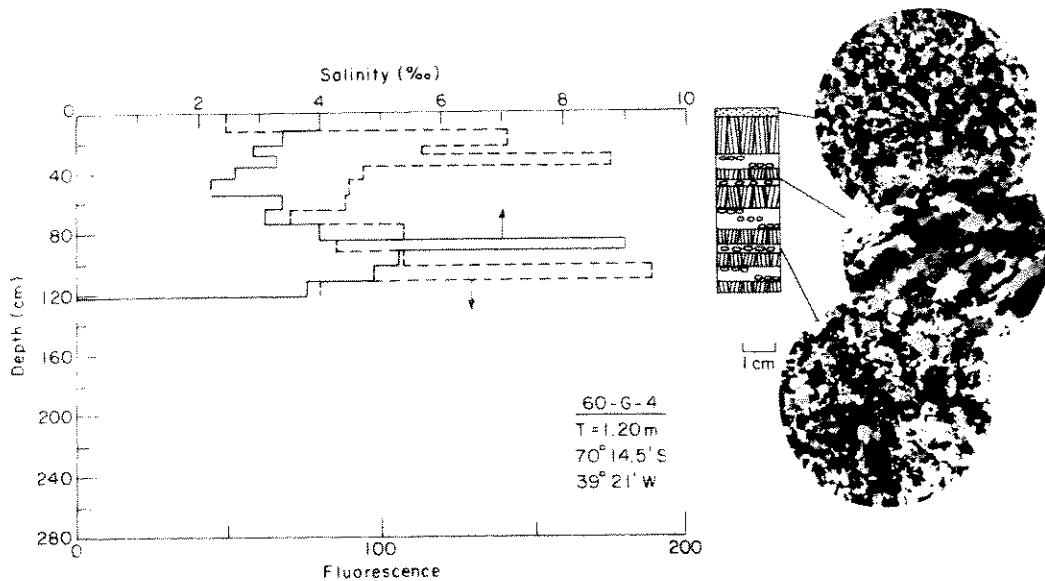


Figure A50. Site 60-G-4.

This first-year, 1.20-m-thick floe was composed of alternating layers of frazil ice and congelation ice, with the latter predominating (64%). Frazil ice was of uniform size throughout, averaging 2-3 mm. The average salinity was 4.0‰. Two fluorescence peaks occurred in the top and bottom frazil ice layers. The alternating layers of congelation and frazil ice in this core possibly indicate an origin by rafting.

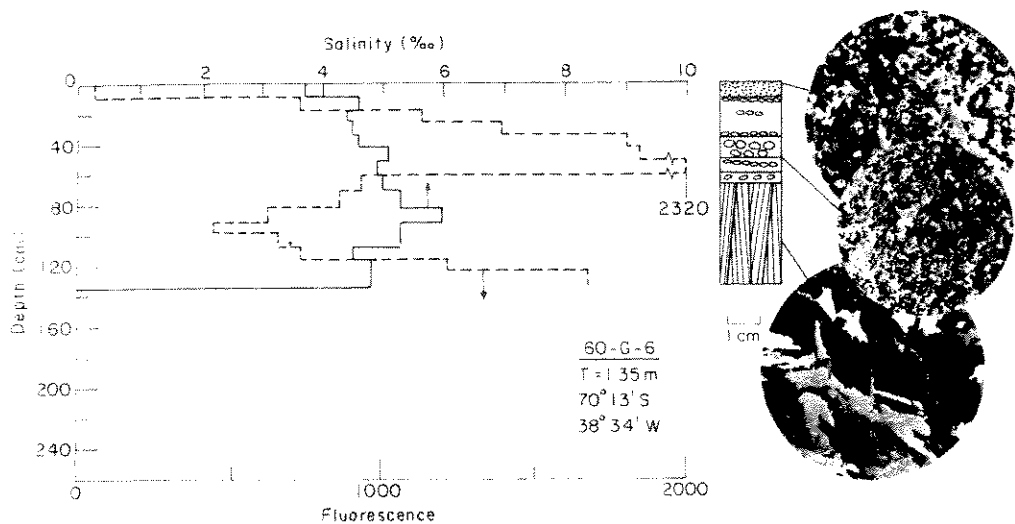


Figure A51. Site 60-G-6.

This first-year ice was 1.35 m thick and consisted, in order from the top, of 9% mixed snow and frazil ice, 40% frazil ice and 51% congelation ice. The bottom of the congelation layer was composed of very large crystals and also exhibited well-developed brine drainage channels. Several coarse-grained zones in which grain diameters exceed 5 mm were observed in the frazil ice. The peak fluorescence of 2320 was recorded in the bottom of the frazil layer. A second peak of 1679 was measured in congelation ice at the bottom of the floe. Salinities were remarkably uniform; the mean salinity was 4.9‰.

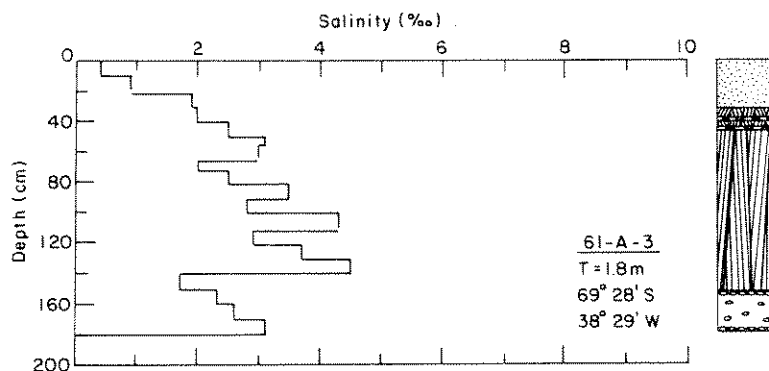


Figure A52. Site 61-A-3.

Tentatively identified as first-year ice, this floe measured 1.8 m thick and consisted of congelation ice (64%) overlain by mixed frazil and snow ice (18%) and underlain by frazil ice (18%). The floe had very low salinities, averaging only 2.6‰, a value possibly more in keeping with thin multi-year ice.

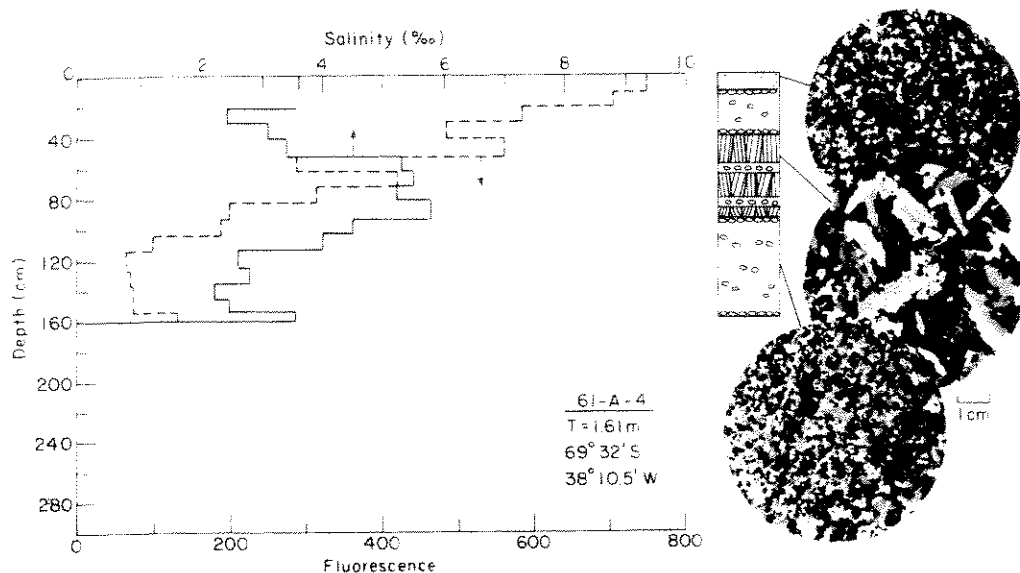


Figure A53. Site 61-A-4.

This first-year ice, measuring 1.61 m thick, was composed of alternating layers of frazil ice (68%) and congelation ice (25%). The c-axes of congelation ice crystals were not visibly aligned. The fluorescence peaked in the surface sample and decreased with depth; in the lower half the fluorescence correlated closely with salinity, which averaged 3.7‰.

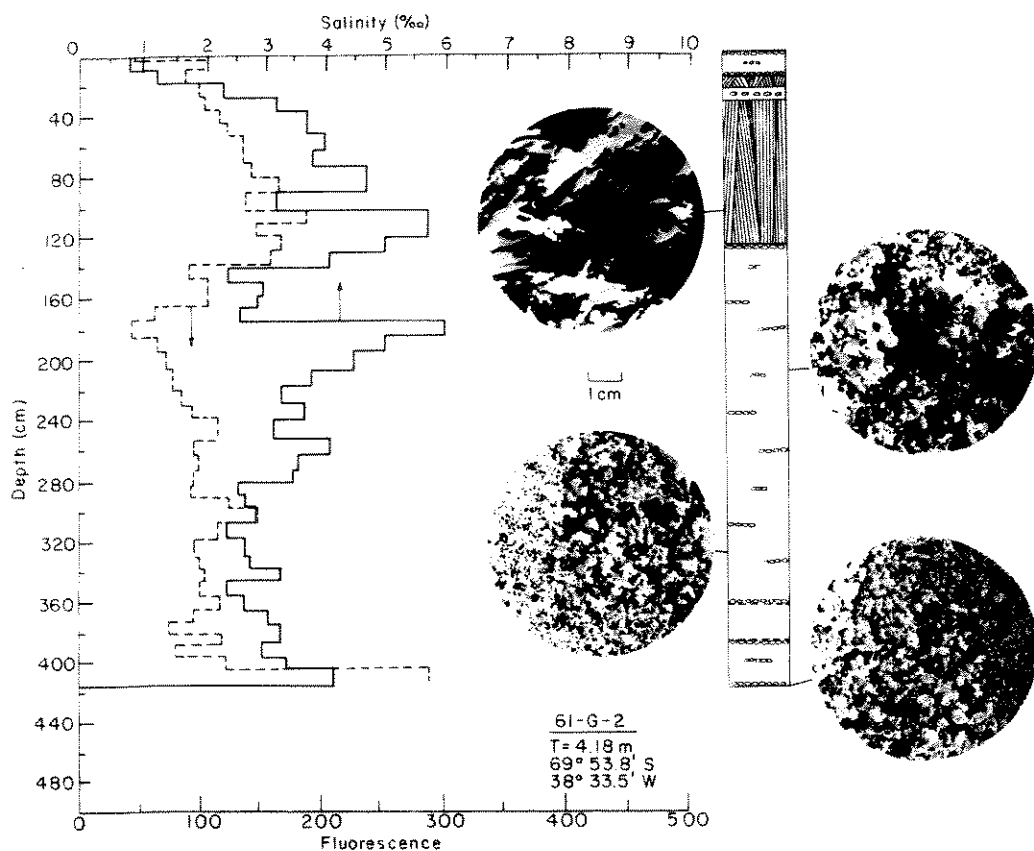


Figure A54. Site 61-G-2.

This multi-year floe, 4.18 m thick, consisted of 25% congelation ice that was limited to the top 1.3 m and was underlain by frazil ice representing 75% of the total ice thickness. The top of this floe was not as severely desalinated as is the case with most multi-year floes. The salinities never exceeded 6‰, and the average salinity was 3.5‰. The size of the grains in the frazil ice varied over a considerable range, as amply demonstrated in the thin sections. No significant peaks in the fluorescence were observed except for a minor peak of 282 at the bottom. The first-year growth apparently ended at the bottom of the congelation ice layer, and all subsequent growth occurred in the frazil regime.

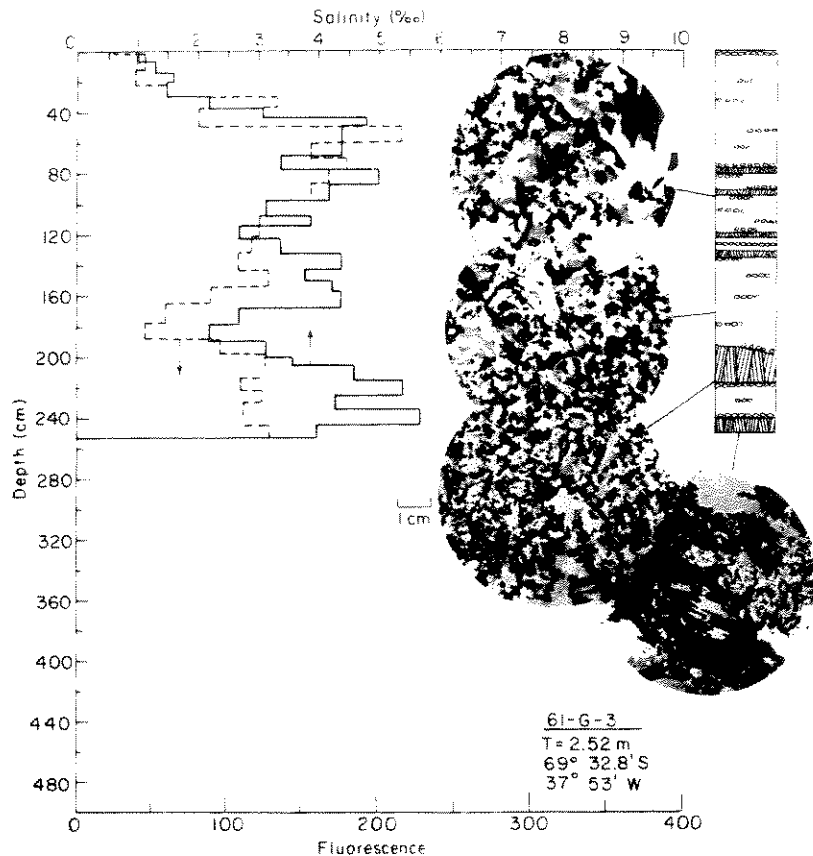


Figure A55. Site 61-G-3.

This floe is 2.52 m thick and probably of multi-year origin, based on the low salinity values in the top 40 cm. The mean salinity was 3.5‰, and the maximum salinity was 5.7‰. Structurally, this floe is characterized by interlayered frazil and congelation ice, possibly related to rafting. Frazil, with grains ranging in size from 1 to 3 mm, was the predominant ice type, however, representing 82% of the total thickness. Thin sections from 95 and 215 cm both exhibited transitional textures. In the section from 95 cm, elongated crystals of congelation ice displaying a characteristic brine lamella and ice plate structure could be easily distinguished from the nearly shapeless grains of frazil. Congelation ice from the bottom of the floe displayed moderately strong alignment of its crystals, indicative of growth under essentially stationary conditions in the pack. The fine-grained structure in the same section was composed mainly of refrozen material in brine drainage channels. The fluorescence generally fluctuated sympathetically with the salinity profile.

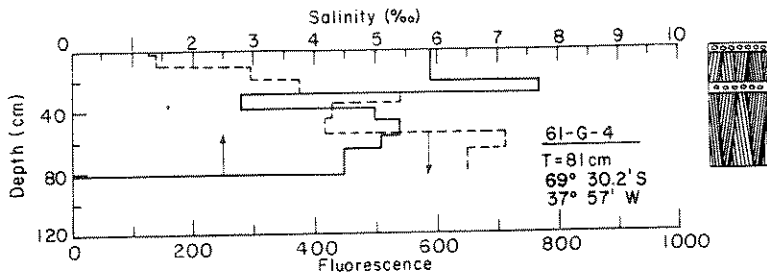


Figure A56. Site 61-G-4.

This first-year ice (0.81 m thick) consisted principally of congelation ice (85%) and two thin layers of frazil ice. The salinity averaged 5.2‰, and the maximum was 7.7‰. Brine channeling was prominent between 20 and 40 cm. The fluorescence increases with depth; peak values of 600–700 were recorded in bottom ice.

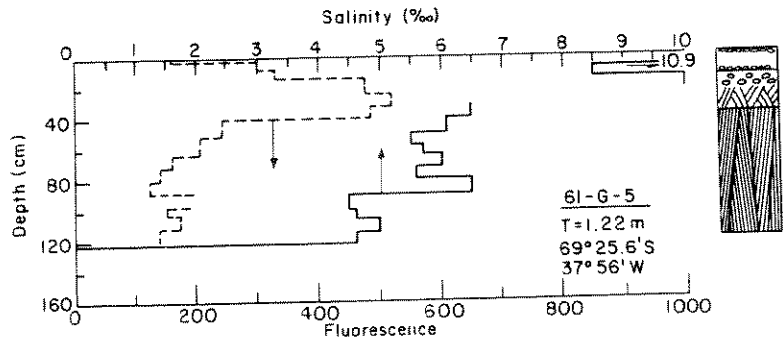


Figure A57. Site 61-G-5.

This 1.22-m-thick floe of first-year ice consisting of frazil ice (21%) overlying congelation ice (79%). The top of the congelation ice was characterized by very large crystals. This floe proved unusually saline; the average salinity was 6.4‰, with a maximum of 10.9‰ in the top 10 cm. The zone of peak fluorescence (520) coincided with the junction of the coarse-grained congelation ice layer and the frazil ice directly above it; algae bands were also observed in the frazil ice.

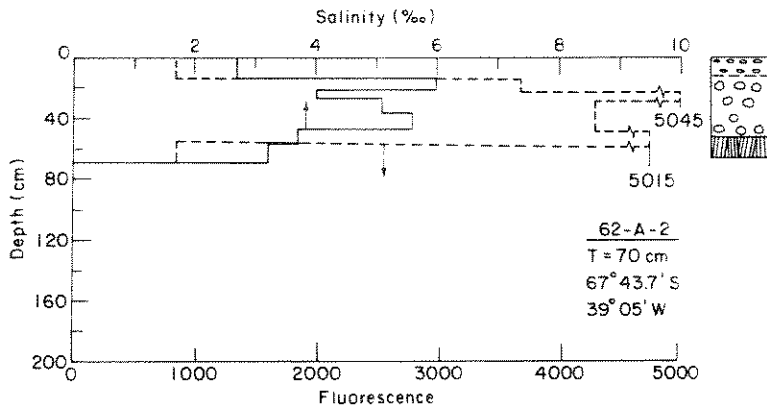


Figure A58. Site 62-A-2.

This 70-cm-thick, first-year floe consisted mainly of coarse-grained frazil ice, representing 79% of the total ice thickness, overlying a thin layer of congelation ice (21%) formed on the bottom of the floe. The average salinity of the floe was 4.3‰. A zone of high fluorescence was observed between 21 and 57 cm. This zone included two peaks exceeding 5000, with the second peak, at 47-57 cm, also occurring in conjunction with algae-rich ice containing numerous brine channels.

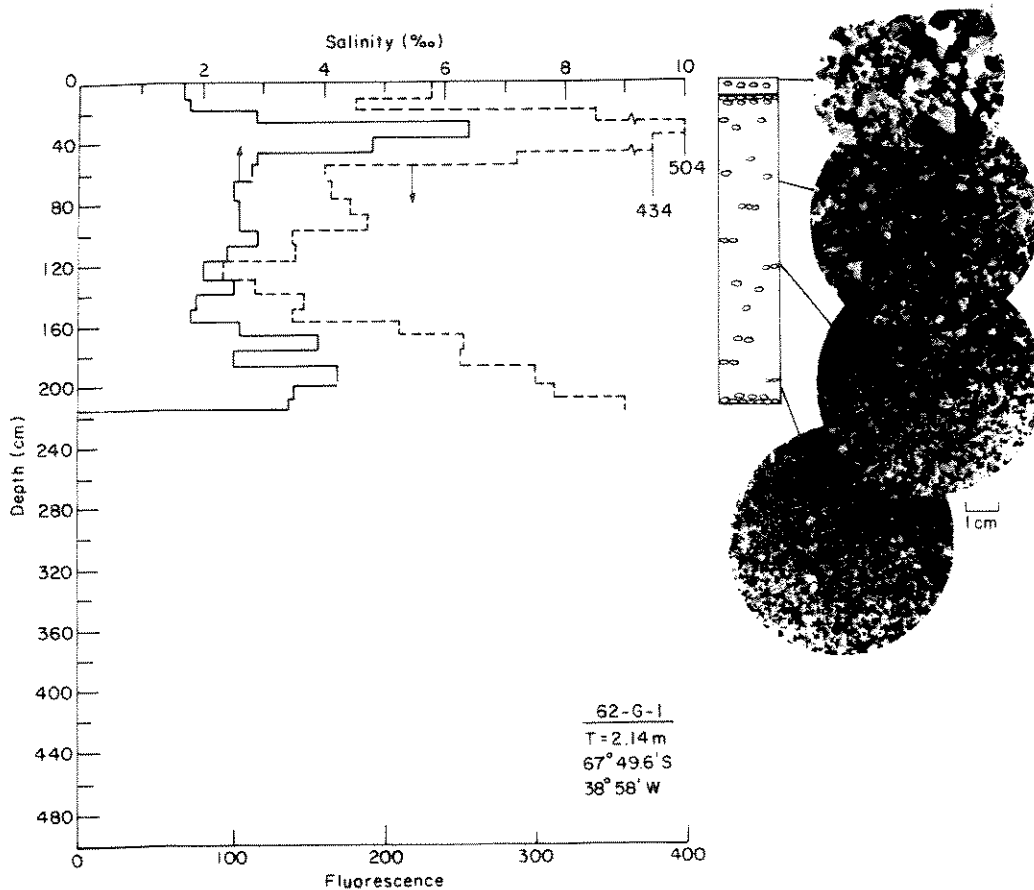


Figure A59. Site 62-G-1.

This first-year floe, 2.14 m thick, was composed completely of frazil ice. Apart from the top 10 cm, which contained many grains larger than 5 mm, the frazil ice in this floe displayed a fairly narrow range of grain sizes, averaging 2-3 mm in cross-sectional diameter. The average salinity was 2.9‰. The maximum salinity of 6.4‰ coincided with a fluorescence peak of 504 at 27-37 cm. In general the salinity and fluorescence profiles fluctuated in parallel.

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v, 75 p., illus.; 28 cm. (CRREL Report 87-14.)

Bibliography: p. 31.

1. Ice. 2. Ice characteristics. 3. Sea ice. 4. Weddell Sea. I. Ackley, Stephen F. II. Buck, Kurt R. III. Golden, Kenneth M. IV. United States. Army. Corps of Engineers. V. Cold Regions Research and Engineering Laboratory, Hanover, N.H. VI. Series: CRREL Report 87-14.