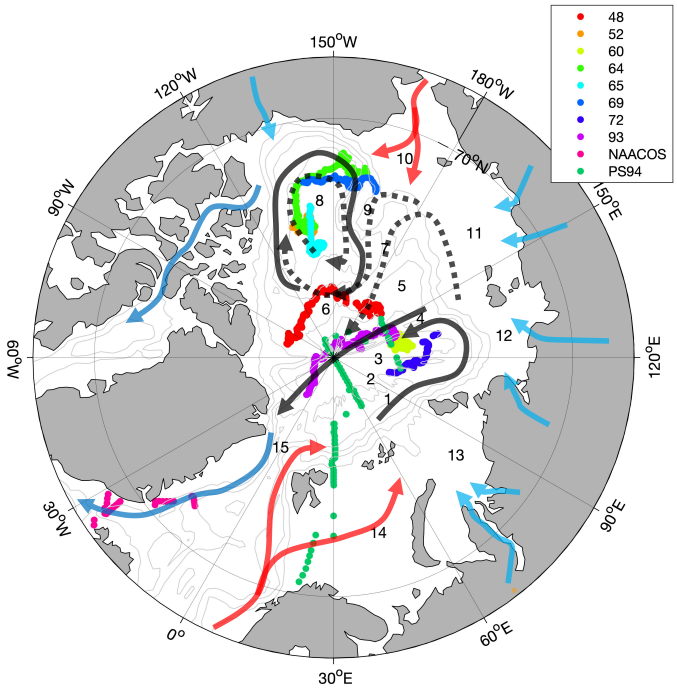

Figure 1: ITP drift pathways, cruise stations and schematic of general circulation pathways. Red arrow indicate inflowing ocean water; Blue arrows polar water exiting Arctic, Light-blue major Arctic rivers. Black indicates two features of the central Arctic, Transpolar drift extending from shelf and passing over the pole, and the Beaufort Gyre. Solid and dotted lines indicate position of these under positive and negative Arctic Oscillation (Morison et al 2012). Legend indicates the ITP and cruise identity. The numbers on the map indicate areas: 1) Nansen Basin; 2) Gakkel Ridge; 3) Amundsen Basin; 4) Lomonosov Ridge; 5) Makarov Basin; 6) Alpha Ridge; 7) Mendelev Ridge; 8 Beaufort Sea; 9 Chukchi Plateau; 10 Chukchi Sea; 12) East Siberian Sea; 13) Kara Sea; 14) Barents Sea; 15) Fram Strait.

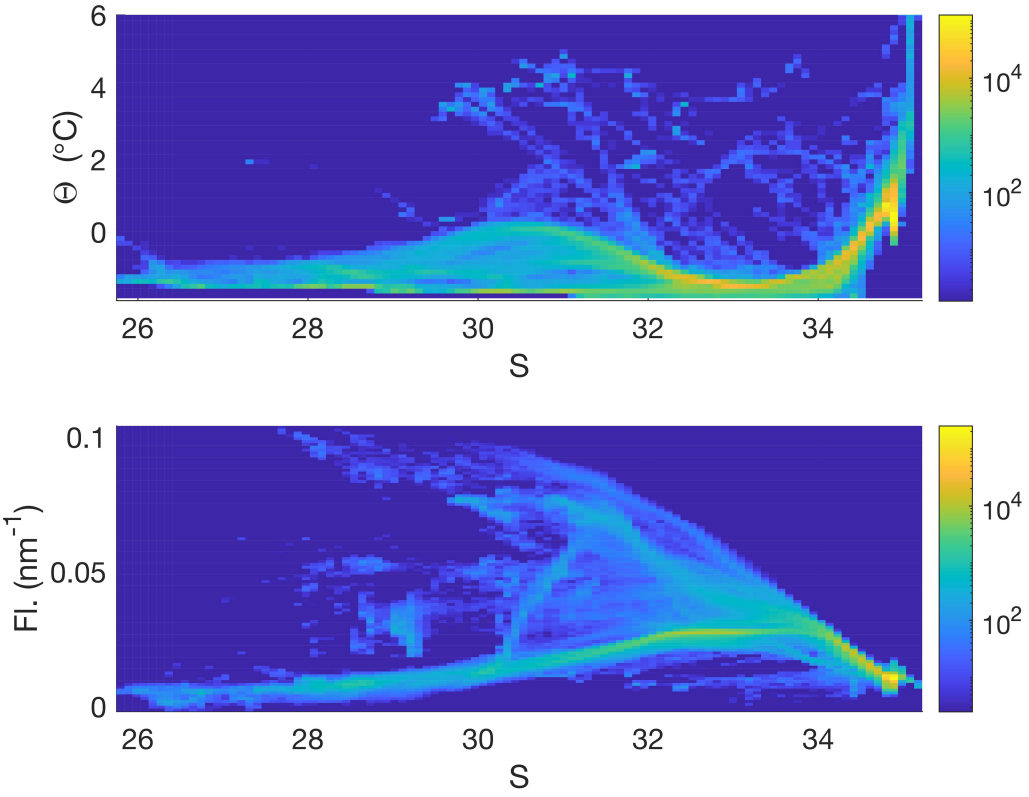

Figure 2. 2D histograms of potential temperature (top panel) and) and DOM fluorescence (bottom panel) against practical salinity for all observations included in the study (0-800m). Note data with temperatures warmer than 6ºC are not shown.

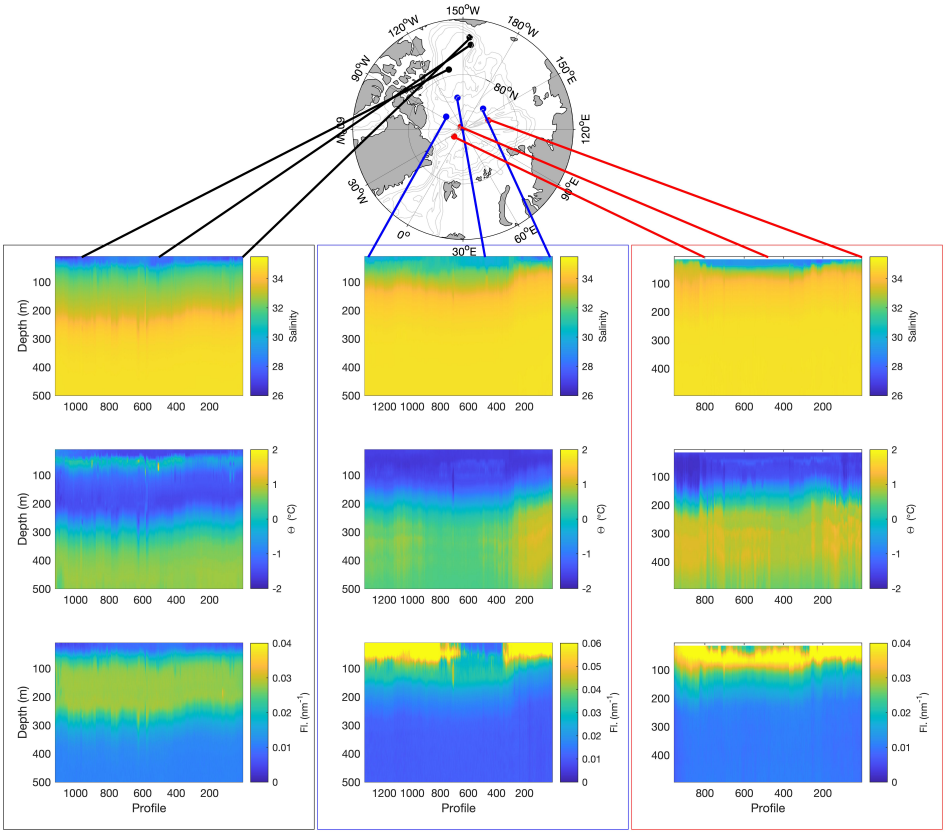

Figure 3. Section plots along the trajectories of ITP 64 (left column), 48 (middle column) and 93 (right column) for salinity (top row), potential temperature (middle row) and DOM fluorescence (bottom row). The links to the map indicate where specific profiles along the trajectory originate from. Note the DOM fluorescence scale is varies and there are data from ITP 48 and 93 that are off scale (above the maximum shown).

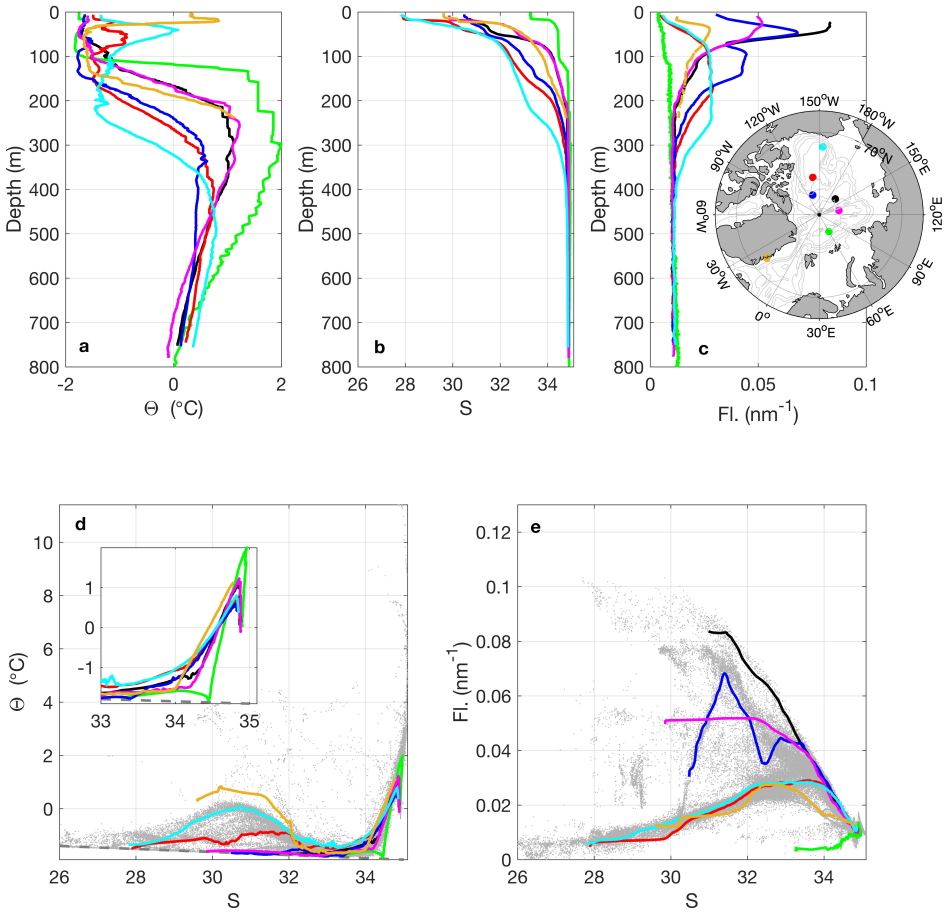

Figure 4. Archetypical water column profiles of a) potential temperature, b) practical salinity and c) DOM fluorescence. The lower panels show property-property plots d) potential temperature against practical salinity (freezing temperature as grey dashed line) and e) DOM fluorescence against salinity. Green-PS94; Magenta-ITP60; Black-ITP48; Blue-ITP48; Red-ITP65; Cyan-ITP64; Brown-NAACOS.

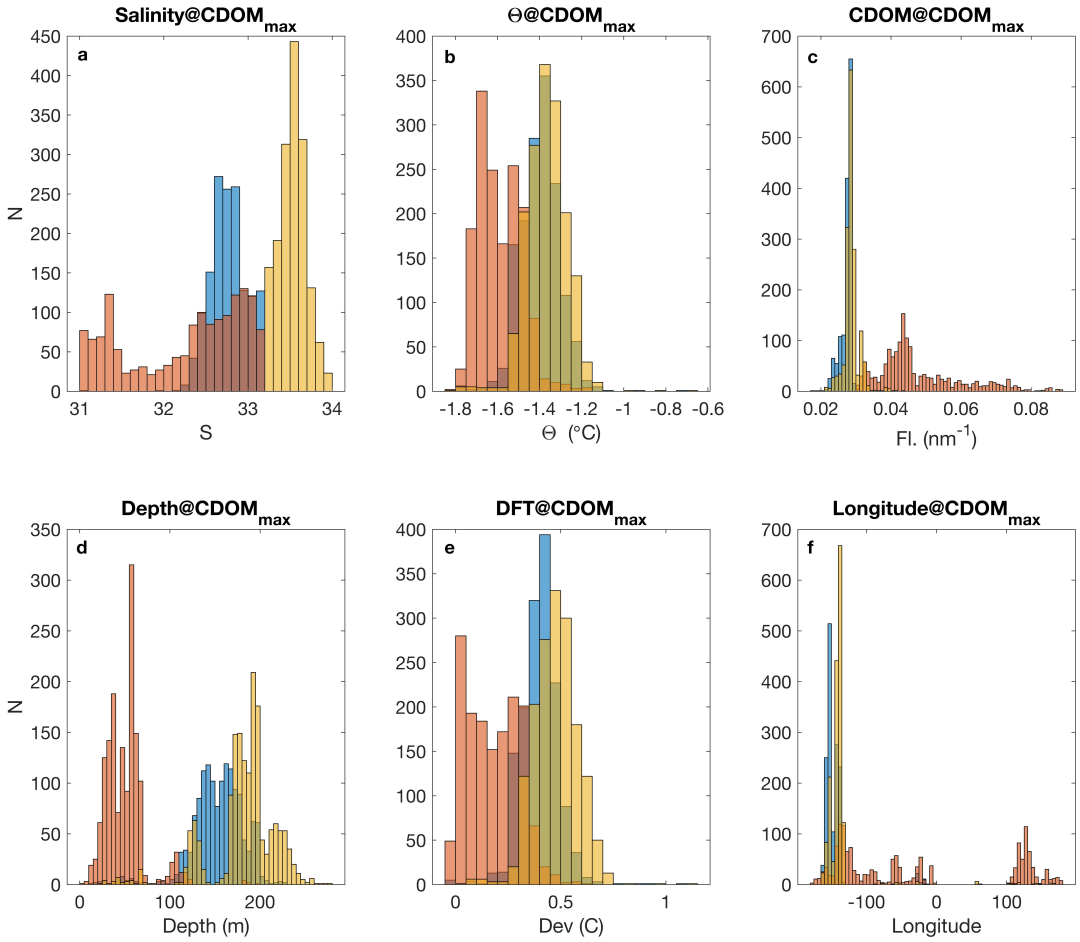

Figure 5: Histograms of properties of the DOM fluorescence maximum in the halocline (S 31-34). The data are colored with respect to three groups, to illustrate different features: blue-salinity 31-33.2 and DOM fluorescence <0.0305 nm^{-1}; red-salinity 31-33.2 and DOM fluorescence >0.0305 nm^{-1}; yellow-salinity>33.2; a) practical salinity; b) potential temperature; c) DOM fluorescence; d) depth of temperature maximum; e) deviation from freezing temperature; and f) distribution of longitudinal position between groups.

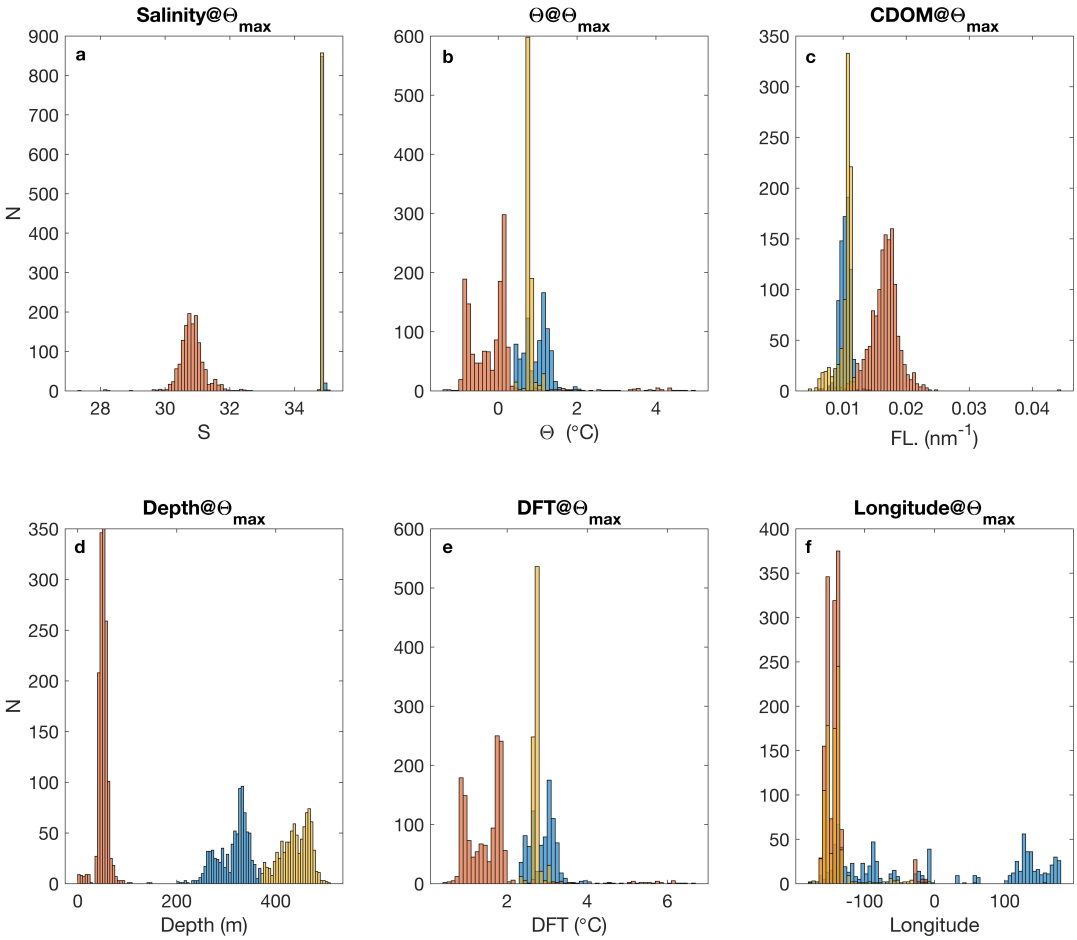

Figure 6: Histograms of properties of the potential temperature maximum. The data are colored to illustrate different features: blue-salinity >33 and depth between 200 and 370 m; red-salinity<33; yellow-salinity>33; a) practical salinity; b) potential temperature; c) DOM fluorescence; d) depth of temperature maximum; e) deviation from freezing temperature; and f) distribution of longitudinal position between groups.

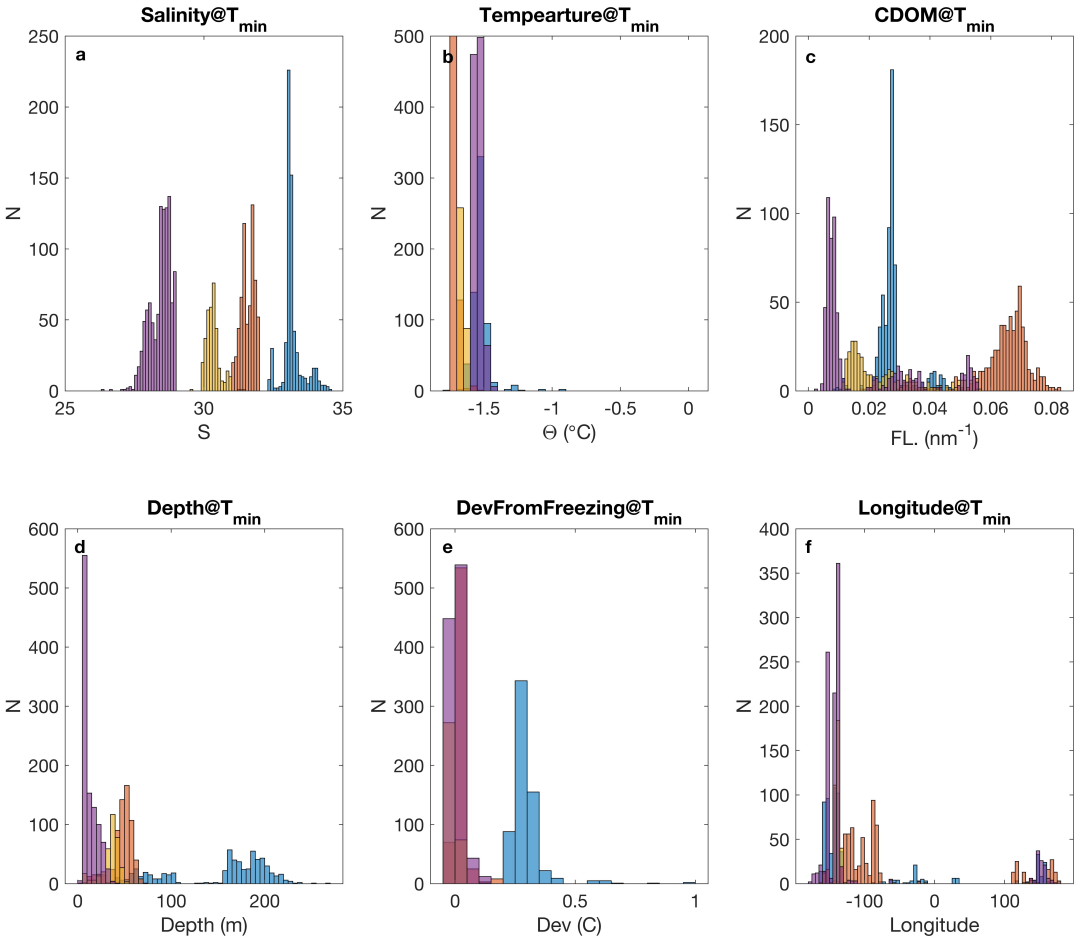

Figure 7: Histograms of properties of the potential temperature minimum. The data are colored to illustrate different features: blue - deviation from freezing temperature > 0.2ºC; red - deviation from freezing temperature < 0.2ºC and 31<S<32; yellow - deviation from freezing temperature < 0.2ºC and 29.5<S<31; purple - deviation from freezing temperature < 0.2ºC and salinity <29; a) practical salinity; b) potential temperature; c) DOM fluorescence; d) depth of temperature maximum; e) deviation from freezing temperature; and f) distribution of longitudinal position between groups.

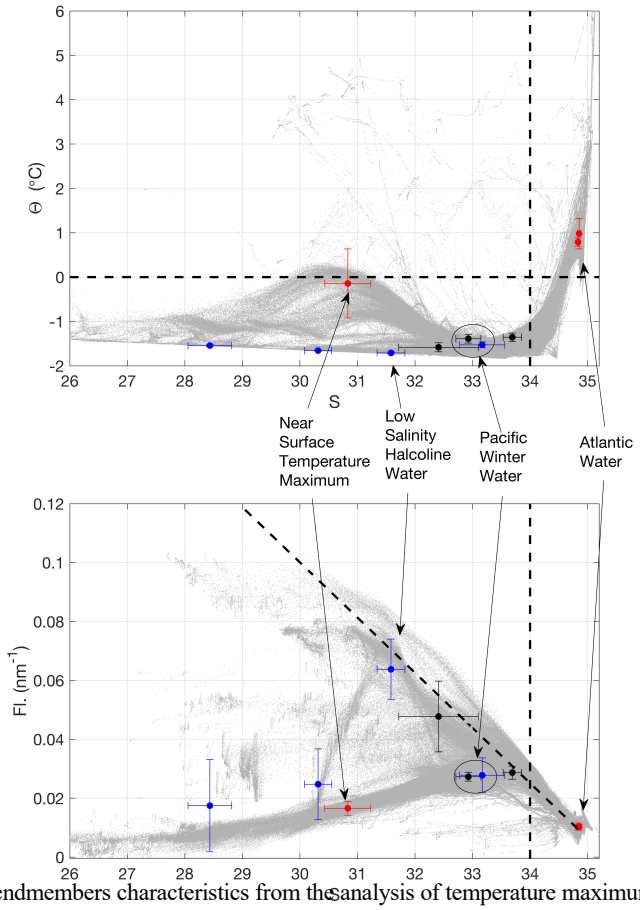

Figure 8: Mean endmembers characteristics from the analysis of temperature maximum (red), temperature minimum (blue) and DOM fluorescence (black) maximum properties plotted together will all data (grey). The error bars indicate standard deviation. The top graph is potential temperature against practical salinity and the bottom graph is DOM fluorescence against practical salinity. The horizontal dashed line represent the 0 degree isotherm and the vertical line the 34 isohaline. The diagonal represents a theoretical mixing line between Siberian shelf water (Gonçalves-Araujo et al., 2016) and Atlantic water.

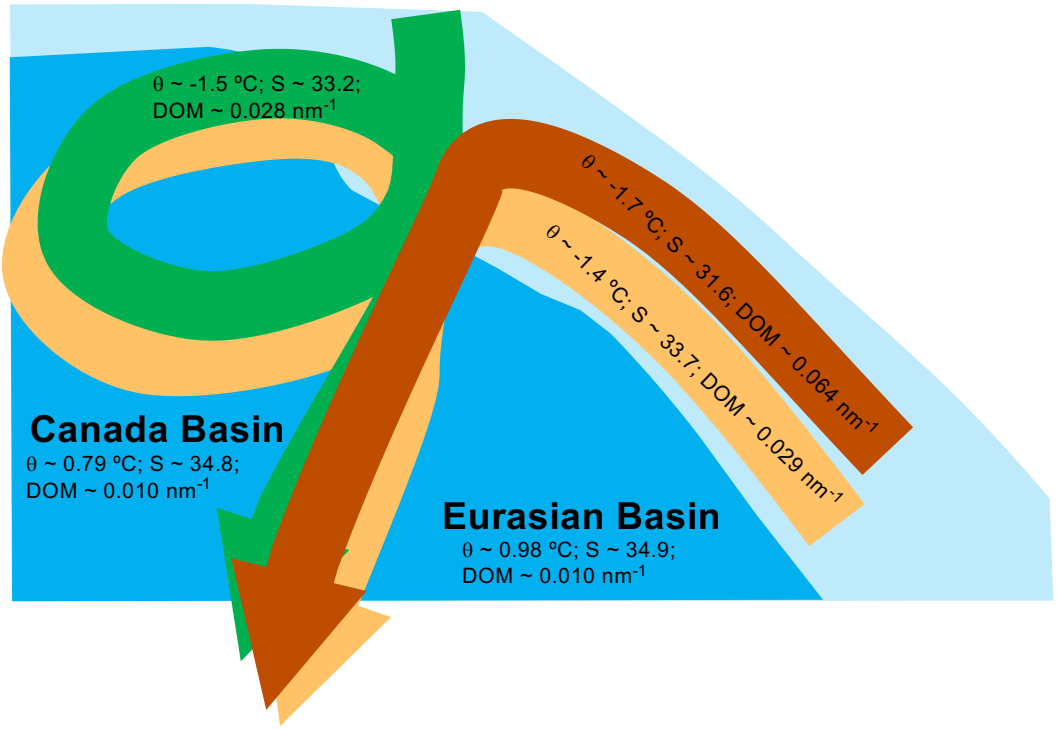

Figure 9: Schematic indicating the three major DOM fluorescence pathways in the upper halocline (S<34). The dark brown arrow indicates the low saline (S<33) shelf waters of the TPD with high DOM fluorescence (>0.04 nm^{-1}) that is restricted to the surface 100m.. The light brown arrow indicates higher salinity HL waters (33-34) which are formed as an intermediate between TDP and AW. These extend below the TPD and in the Canada Basin form a layer above warmer Atlantic water. The green arrow indicates the Chuckchi shelf waters which which originate from the Pacific inflow and have high DOM fluorescence from shelf sediments. These lie between a dilute PML with low salinity and DOM fluorescence due to sea ice melt, and the HL originating from the Eurasian Basin. The dark blue indicate AW. Indicated are the average properties from the end member analysis.