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Pseudo-thermal bar in poorly salted autumnal waters of the Gulf of Finland from satellite-airborne SAR/ASAR/ALSAR survey

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The thermal bar (TB) was disclosed at the end of XIX century by F.A. Forel – world-famed founder of limnology, who studied different processes in Lake Leman from point of view ecology and hydrobiology. Forel supposed that TB arises in temperate large lakes for short period in spring in presence windless calm weather. Well-directed investigations of TB were recommenced in the beginning 1950-s at the Institute of Lake Research Russian Academy of Sciences by Dr A.I. Tikhomirov who had described also specific features of this phenomenon in fall.
At the end of 1960-s we began examination thermal and ice regime of fresh and saltish inland water bodies with using remote sensing including multi-spectral airborne-satellite SLR/SAR/ASAR/ALSAR survey. And as result the possibility revealing TB parameters in fall season by low-frequency radar (ALSAR) installed onboard research aircraft was fixed documentally in the Lake Ladoga [Melentyev et. al., 2002].
According to [Tikhomirov, 1959] TB represents convergence zone around temperature of maximum density of fresh water + 4 °C (3, 98 °C, really). This narrow vertical "curtain" appears in littoral in spring owing to heating coastal waters, in fall – due to its cooling. TB divides large lakes and artificial reservoirs on two unequal thermic zones – heat-active (HAZ) and heat-inert (HIZ) that has different stratification of water temperature.
Possible existence of TB in poorly salted sea waters was predicted by outstanding Russian oceanographer professor N. Zubov. Obviously firstly it was disclosed but without explanation the physics by [Bychkova, 1987]. Our own sub-satellite studies onboard nuclear icebreaker "Jamal" in western Arctic in fall 1996 allows reveal the TB on saltish waters in north-eastern "corner" of the Yenisei Gulf in mixing zone of marine and river waters. Long-lived converged zone that we call as pseudo-thermal bar (PTB) was marked by stationary banding narrow continuous rough strip that could be destroyed by passing motor boats but rehabilitated oneself soon.
The goal this paper presents some cases satellite-airborne SAR/ASAR/ALSAR diagnostics PB/PTB in polytypic waters in fall and monitors its temporal and spatial modification in NE part the Gulf of Finland as well discussing explanation this phenomenon that is important in many utilitarian hydrological ecological and hydrobiological applications. According to our assumption in season autumnal belated cooling in zone of mixture marine and river waters occurs sometimes uneven heating of super cooled river Neva waters by slightly warmer poorly salted sea waters. Just it resulted in appearance of free convection and spontaneous compacting and compressing zone of mixture that provoke the sag and origin of PTB - specific convergence zone that can arise in many other river estuaries and bays in presence mixing fresh and poor saltish sea waters.