Multi-scale synchronized infrared survey of the sea surface temperature of the White Sea

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The information on satellite remote sensing of the Earth surface temperature is widely used. However, the known accuracy of retrieval for the absolute sea surface temperature (SST) from the satellite measurements of operational infrared (IR) scanners, usually seems insufficient to run a proper analysis of mesoscale marine processes and phenomena.Within this study, the peculiarities of SST spatial field over the White Sea, as detected by AVHRR instruments onboard NOAA satellites, have been compared to simultaneous measurements of airborne IR-radiometer from the laboratory of "PINRO" onboard An-26 "Arctic". These observations have been carried out in the framework of a complex airborne experiment, which took place over the White Sea in summer 2001. To compare so different spatial data it became possible by means of GIS-technologies.Resulting time series of an averaged and strictly geo-referenced airborne SST observations were then compared to corresponding satellite data on radiative SST temperature. The use of GIS have let to co-locate that data in space within a size of AVHRR ground pixel for the whole trajectory of aircraft during the 4 hours of White Sea survey.The data on satellite IR image of the White Sea for particular time was provided by NOAA AVHRR operational dataset at Satellite Active Archive (SAA) Internet server. Preliminary analysis of AVHRR images was carried out with the "CHIPS" software suite, developed at the University of Copenhagen.Investigation of SST spatial distribution, based on the data of AVHRR, have allowed to reveal a number of features in the surface temperature field for summer time. The gradients of temperature at the entry of White Sea and around the Solovky islands are clearly visible at the image. The maximum gradient across the front is about 6 deg.C (entry front). These frontal zones are dynamically unstable. Based on the satellite information it was possible to produce combined scheme of SST spatial distribution and frontal zones over the whole area of White Sea. The more detailed picture of temperature fronts characteristics was given by the measurements of airborne IR-radiometer, which occurred each 85-90 meters along the flight. The study of that data have revealed more irregular SST distribution. Most of the low-scale frontal zones, associated with the local heating of surface water or special features of coastal zone dynamics, were depicted from the data of airborne observations only.Comparative analysis of remotely sensed data have shown a systematic overestimation of absolute SST value by airborne radiometer with respect to satellite measurements (from 0.2 to 2.0 deg.C).According to comparison, locations of the main frontal zones in the White Sea revealed from simultaneous satellite and airborne radiometer measurements, are much alike. The peculiarities of SST field, corresponding to mesoscale variability of the marine ocean logic processes, which were found in the data of both observations, are very similar.The spectral structure of spatial SST variation, computed with the data of satellite and airborne measurements, have the same character.