Geophysical Research Abstracts
Vol. 12, EGU2010-1649-1, 2010
EGU General Assembly 2010


# Effects of artificial sea film slick upon the atmospheric boundary layer structure

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Organic surface-active compounds accumulate at the ocean-atmosphere boundary, influencing several air-sea interaction processes. In coastal areas with high biological activity this accumulation frequently becomes visible as mirrorlike patches (“slicks”) on the sea surface.
The artificial surface films of oleyl alcohol and vegetable oil were produced in the Black Sea coastal zone (one site was located near Gelendjik and another was near Crimea coast) to investigate its influence on energy and gas exchange between atmosphere and sea surface under different meteorological conditions.
The atmospheric turbulence measurements during the passage of an artificial sea slick are compared with similar measurements without a sea slick. The effects of the slick are modifications of roughness length z0, and a possible increase in mean wind speed. In the mean, during the passage of the slick, the roughness length decreased while the mean wind speed appeared to increase.
For the spectral comparison we compared the wind field over the sea during the time the film slick was in the vicinity of the measurement site with the wind field observed after the slick had passed. The cross-spectral density was computed between horizontal velocity and vertical velocity (Reynolds stress) and between atmospheric temperature and vertical velocity (heat flux).
The introduction of the sea film slick, with its damping and suppression of capillary waves, appears to completely destroy the atmospheric turbulence generation. When a slick is present, the U-W phase angle and Reynolds stress spectrum for the atmosphere appear to be completely unaffected by undulating sea surface directly below the sensors. Spectral and wavelet analysis of the atmospheric surface layer characteristics showed a significant correlation between the processes on the sea surface and the atmospheric boundary layer. An intensification of change processes in the vicinity of the windward slick boundary are detected. It may be connected with the formation of internal boundary layer over the slick.
Gas exchange, in this case desorption of CO2 was determined before and after formation of the artificial surface film. In the one experiment performed inhibition of exchange was significant when the film was present.
These results demonstrate the importance of observing small-scale atmospheric processes near the sea surface. It is strongly recommended that this technique be exploited to its fullest to enhance our understanding of the small-scale processes at the air-sea boundary. The experiments have confirmed the influence of surface-active compounds, including oil pollution, which have been significantly changed the state of the sea surface, the processes in the atmospheric turbulent layer.The results also have important implications on ocean remote sensing applications.
The work was supported by RFBR (grant 08-05-00099, grant 08-05-00890).