Geophysical Research Abstracts, Vol. 7, 07319, 2005 SRef-ID: 1607-7962/gra/EGU05-A-07319 © European Geosciences Union 2005



Dynamics of Kelvin waves in the stratified Lake of Geneva

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The passage of Kelvin waves in Lake Geneva has been experimentally investigated in 1987 and 2002. Thermistor chains and current meters were employed in the 1987 campaign in order to investigate the occurrence of Kelvin waves after strong north-east wind events. Characteristics of these internal waves such as period, vertical excursion of the thermocline, logarithmic decay with distance from shore and damping of their oscillation have been determined. Detailed vertical velocity profiles were measured during the passage of Kelvin waves with two ADCPs in the 2002 campaign in the whole water column, including the bottom boundary layer. The occurrence of Kelvin-Helmholtz instabilities was observed in the thermocline region and explained by means of a comparison between the mean stratification during the Kelvin wave event and the vertical gradient of the velocity. The passage of a Kelvin wave leads to a well-mixed bottom boundary layer characterized by a logarithmic velocity profile, complying with the so-called law of the wall. Characteristics of this bottom boundary layer such as the maximum height of the logarithmic profile and the bottom drag coefficient have been derived from the measurements.