DIRECT NUMERICAL SIMULATION OF INTERNAL WAVES FORMATION IN HIGHLY STRATIFIED WAKE FLOW

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ABSTRACT

Numerical simulation of stratified flows are performed in comparison with high resolution laboratory experiments [1,2], allowing a detailed description of the transient processes occurring from the impulsive starting of the flow up to the formation of completed internal waves field. A finite differences solver [3] has been adapted to the low Reynolds Navier-Stokes equation with transport equation for salinity [2,4]. Details of the resolved flow pattern as obtained from CFD are providing a quantitative description of complex stratified flows that can be expanded to the investigation of oceanic flows patterns involving pycnoclines. s

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References

[1] Chashechkin Y.D., Mitkin V.V. Experimental study of a fine structure of 2D wakes and mixing past an obstacle in a continuously stratified fluid, *Dynamics of Atmospheres and Oceans* 34, 165-187. (2001)

[2] Fraunié P., Berrabaa S, Chashechkin Y.D., Velasco D., Redondo J.M. Large eddy simulation and laboratory experiments on the decay of grid wakes in strongly stratified flows. Il Nuovo Cimento vol 31 Issue 05-06 pp 909-930 DOI: 10.1393/ncc/i2009-10359-x. (2008)

[3] Verzicco R., Orlandi P., Direct simulations of the transitional regime of a circular jet, *Phys. Fluids*, **6**, 751-759 (1994)

[4] H. Houcine 1, Yu.D Chashechkin, P. Fraunié, H.J.S. Fernando, A. Gharbi, T. Lili, Numerical modeling of the generation of internal waves by uniform stratified flow over a thin vertical barrier. Submitted