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Velocity distribution around a sphere descending in a salt-stratified water HIDESHI HANAZAKI, SHINSAKU AKIYAMA, SHINYA OKINO, Kyoto University — When a sphere descends at constant speed in a salt-stratified water, a thin and high-speed jet is often generated above the sphere. The phenomenon has first been observed by shadowgraph and then has been investigated numerically. In this study, a systematic measurement by particle image velocimetry (PIV) has been performed for a wide range of Froude number Fr and Reynolds number Re, to actually observe the numerically simulated velocity distributions and confirm the accuracy of the numerical simulations for a very high Schmidt (Prandtl) number of $Sc = (Pr =)700$. The results show that the radius of the jet is proportional to both $Fr^{1/2}$ and $Re^{-1/2}$, meaning that it is proportional to $\sqrt{Fr/Re}$ (when $F < 1$). The boundary layer on the sphere surface has a thickness comparable to the jet radius, and it is also proportional to $\sqrt{Fr/Re}$. These results are in agreement with the recent numerical simulations and a simple dimensional analysis. Typical diverging internal-wave patterns, whose vertical wavelength has been predicted to be proportional to Fr, could also be observed.

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