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A study on improving numerical stability by applying filter operation to concentration flux for reverse simulation[1] SATOSHI ABE, graduate school, Univ. of Tokyo, SHINSUKE KATO, IIS, Univ. of Tokyo — A reverse simulation based on CFD is considered to be a resolution for identifying pollutant source, which is the solution of a transport equation in negative time advancing. The process is equivalent to positive time advancing with negative diffusion and convection. However, there is a numerical instability problem when solving the negative diffusion. Therefore, in this study, we propose a method to improve numerical stability by applying a low-pass filter to concentration flux in RANS analysis. The following equations are summary of the low-pass filter. By setting an appropriate filter width (Δ), the reverse simulation can be realized. F(x) is the concentration flux in RANS analysis. $\bar{F}(x) = \int_{-\infty}^{\infty} G(r)F(x-r)dr, G(r) = \sqrt{\frac{6}{\pi\Delta^2}} \exp\left(-\frac{6r^2}{\Delta^2}\right), F(x) = \Gamma\frac{\partial C}{\partial x}$ The aim of filter operation to concentration flux is to stabilize concentration balance in control volume. As the result, the following conclusion can be drawn. 1. Filter operation is a useful method for improving numerical stability. 2. The concentration center moves and the standard division of concentration shrink adequately in reverse simulation, which makes it easy to identify pollutant source. In the next stage, we will develop a method to identify the pollutant source stochastically.

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