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**Eigenvalue Analysis for Error Dynamics of Measurement Integrated Simulation to Reproduce Real Flows** KENTARO IMAGAWA, Graduate School of Engineering, Tohoku University, TOSHIYUKI HAYASE, Institute of Fluid Science, Tohoku University — A measurement-integrated simulation (MI simulation) is a numerical simulation with a feedback loop to compensate the difference between the simulation and real phenomena in a condition of different boundary/initial condition. The origin of this methodology is the observer in the control theory. Although the validity of MI simulation has been proved in several applications, such as an ultrasonic measurement integrated simulation of blood flow or hybrid wind tunnel to reproduce Karman vortex street, a theory of MI simulation has not been established yet. As a fundamental consideration to construct a general theory of MI simulation, we formulated the linearized error dynamics equation to express time development of the error between the simulation and the real flow, and its eigenvalue analysis. The validity of the method was investigated for the problem of the low-order model problem of the turbulent flow in a square duct. The result of numerical experiment of MI simulation was well predicted by a result of eigenvalue analysis proving the validity of the eigenvalue analysis of liearaized error dynamics in evaluating the effectiveness of MI simulation.

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