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Reduced-Hermite Bifold-interpolation Assisted Schemes for the Simulation of Random Wind Field

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Abstract: Interpolation techniques have been recently introduced to enhance the computational efficiency of the classical spectral representation method (SRM) in the simulation of random ergodic fluctuations in turbulence. However, the conventional interpolation assisted scheme (IAS) is not efficient enough to cater for cases with a large number of simulation points, where the computational demand of the Cholesky decomposition makes them less attractive. In this study, reduced-Hermite based bifold-interpolation assisted schemes (BIAS), which incorporate the reduced-Hermite interpolation in a bifold-interpolation scheme, are developed to further enhance the efficiency of SRM. The reduced-Hermite interpolation reduces the number of Cholesky decompositions in BIAS to half of that required by the conventional Hermite interpolation. The adoption of the bifold-interpolation technique fixes the number of Cholesky decompositions, thus eliminating the Cholesky decomposition as a cause for effecting the efficiency of SRM. Specifically, BIAS is further classified as

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