Abstract Submitted
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A new symmetric form of the bounce-averaged quasilinear diffusion coefficient in toroidal geometry[1] JUNGPYO LEE, MIT Plasma Science and Fusion Center, MA, USA, DAVID SMITHE, Tech-X Corporation , Boulder, CO, USA, LEE BERRY, ERWIN JAEGER, XCEL Engineering Inc., Oak Ridge, TN, USA, JOHN WRIGHT, PAUL BONOLI, MIT Plasma Science and Fusion Center, MA, USA — Kennel-Engelmann (K-E) quasilinear diffusion coefficients are used in many RF wave codes to couple the Maxwell equation solver with a Fokker-Plank calculation. The diagonal component of the coefficient tensor in the speed direction should be positive in the quasi-linear assumption for the H-theorem. However, in the application to toroidal geometry, the bounce-average of the K-E coefficients does not guarantee positive values for an arbitrary wave spectrum due to the interference between the spectral modes. The negative bounce-averaged diffusion coefficients unexpectedly occur because the K-E coefficient is derived in a cylindrical limit, in which the resonance kernel (gyrofrequency, wave vector and parallel velocity) in the phase integral do not vary along the phase trajectory, while the bounce-average is computed in a toroidal geometry. To guarantee the positiveness, we derive a new form of the diffusion coefficient that keeps the symmetric form between the bounce-integral and the trajectory integral. The new coefficients are implemented in a code for ion cyclotron waves in a tokamak (TORIC). Using the new form, the error of quasilinear diffusion coefficients due to the negative values is reduced significantly, and the toroidal effects are well captured.

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