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Order conditions and efficiency of multirate Runge-Kutta methods for one-dimensional atmosphere-ocean models

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Efficient time integration methods for coupled atmosphere and ocean models are the key to reduce the amount of required computing resources. Splitting of model equations into various components gives the opportunity to apply different time steps for individual components.
Although, it can be shown that multirate Runge-Kutta methods found in the literature can be rewritten as partitioned Runge-Kutta methods, each approach is unique and requires a different amount of resources.
The presentation shall give an overview about these methods. One part will focus on the connection and order conditions of these methods. The other part is contributed to the efficiency using an academic example. Furthermore, we will show how these methods are applied to a one-dimensional atmosphere-ocean model.