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Band approach with selective intermittent strategy – a new way of doing effective and yet accurate radiative transfer calculations?

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There exists a paradox in the evolution of mainstream NWP parameterisation strategies concerning interaction between cloud microphysics and radiative forcing. The former requires increasingly complex investments for delivering both (i) phase-changes-induced thermal and water budgets evolutions and (ii) high-quality input to the cloudy part of radiative computations. Such calculations are however increasingly relying on the choice of linear combinations of independent quasi-monochromatic computations (k-distribution methods). It follows that their computing cost becomes too high for a grid-point by grid-point and time-step by time-step use of the above-mentioned dearly acquired input (cloud amount and optical properties). This is a structural problem linked to the parallel use of mostly redundant information (cloud properties vary spectrally far less than gaseous ones) in many independent solvers. The revival of the Net Exchange Rate (NER) way of solving the radiative transfer equation offers, in our opinion, an interesting alternative. One must be able, first, to get a similar accuracy to that of k-distribution computations for the dominating Cooling To Space (CTS) and Exchange With Surface (EWS) terms and, second, to approximate the smaller order terms (Exchange Between Layers, EBL) on the basis of self-learning and/or statistical compacting-type algorithms. Once this is achieved; it is possible to capitalise on the observed fact that long-wave gaseous radiative forcing varies far slower than its cloudy counterpart. This naturally leads to a selective-intermittency strategy where cloudy input is always refreshed while the compacted NER information (for cheaply recomputing CTS, EWS and EBL terms) is kept frozen for hourly long spells. We shall show the challenges one must overcome for applying this strategy at equal overall costs and the structural advantage it eventually brings in.