How to cope with radiation on 500m?
(some thoughts by Ján Mašek, 05-Apr-2022)

- 3D radiation interacting **across** the model columns is currently out of reach, but these effects cannot be ignored on 500m scale
- path advocated by Bent and Kristian: stay on 5km **reduced radiation grid,** where independent column approximation is still justified
- this seems to be a reasonable **intermediate step,** so let's elaborate it a bit more
- to reduce bias of resolved radiative fluxes on 5km scale, **subgrid 3D radiative effects** can be parameterized

What is available

- necessary components for impact study are already available in **ecRad scheme:**
- **SPARTACUS solver** taking into account **subgrid** radiative transfer across the cloud sides
- **reduced radiation grid -** so far available only on IFS side, implementation on ARPEGE side is planned

What can we add

- binary character of clouds on 500m scale enables to replace ad hoc cloud overlap hypothesis by something more realistic, based on the **true overlaps of adjacent cloud layers on 5km scale**
- cloud info on 10x10 subsquares of the radiation grid enables to replace parameterization of **effective cloud edge length** (key quantity in SPARTACUS solver) by its more **direct estimate**
- microphysical data on 500m scale provide information about **cloud inhomogeneity on 5km scale,** it could be used to evaluate cloud optical saturation

Is it feasible?

- cost of SPARTACUS solver is **6 times higher** than operationally used McICA solver
- combined with **100x reduced number of points** in the radiation grid, it should be affordable (for operational IFS reduction factor is 6.25)
- additional saving could be used to **increase frequency of radiation calculations** (1 hour is surely not enough to capture evolving clouds, 15 minutes is still disputable)
- main investment needed is a **manpower** for implementation and testing of the above given ideas => **can we allocate it?**