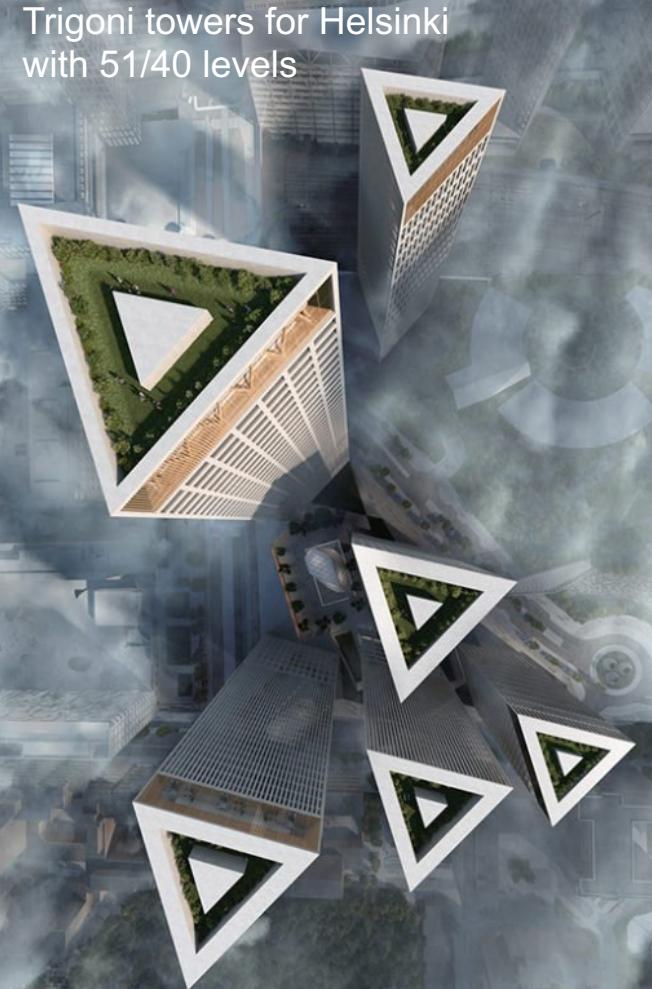


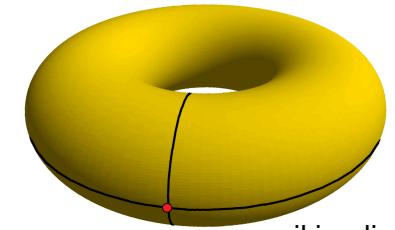
Trigoni towers for Helsinki  
with 51/40 levels



Lahdelma & Mahlamäki architects

# ICON SCM

*Martin Köhler, DWD*



wikipedia

## ICON SCM community

- *Anurag Dipankar* grid design for LES and SCM as pseudo 2-D torus
- *Chris Moseley* time-dependent forcing
- *Mirjana Sakradzija* RICO case with EDMF turbulence
- *Martin Köhler* nudging, reproducing 3D ICON column
- *Ivan Bastak Duran* external netcdf SCM input files, dephy test
- *Tobias Göcke* fog case
- *Daniel Klocke* CRM simulation to mirror SCM case
- *Sophia Schäfer* radiation tests - correlated-K distribution (CKD) MIP
- *Vera Maurer* energy and water conservation with SCM
- *Uni. Köln and Alfred Wegner Institute* joining

# nudging instability – unsolved in ICON-SCM

**nudging equation:**  $\frac{dT}{dt} = \frac{T_x - T}{\tau}$ ,  $T_x$ = external nudging profile

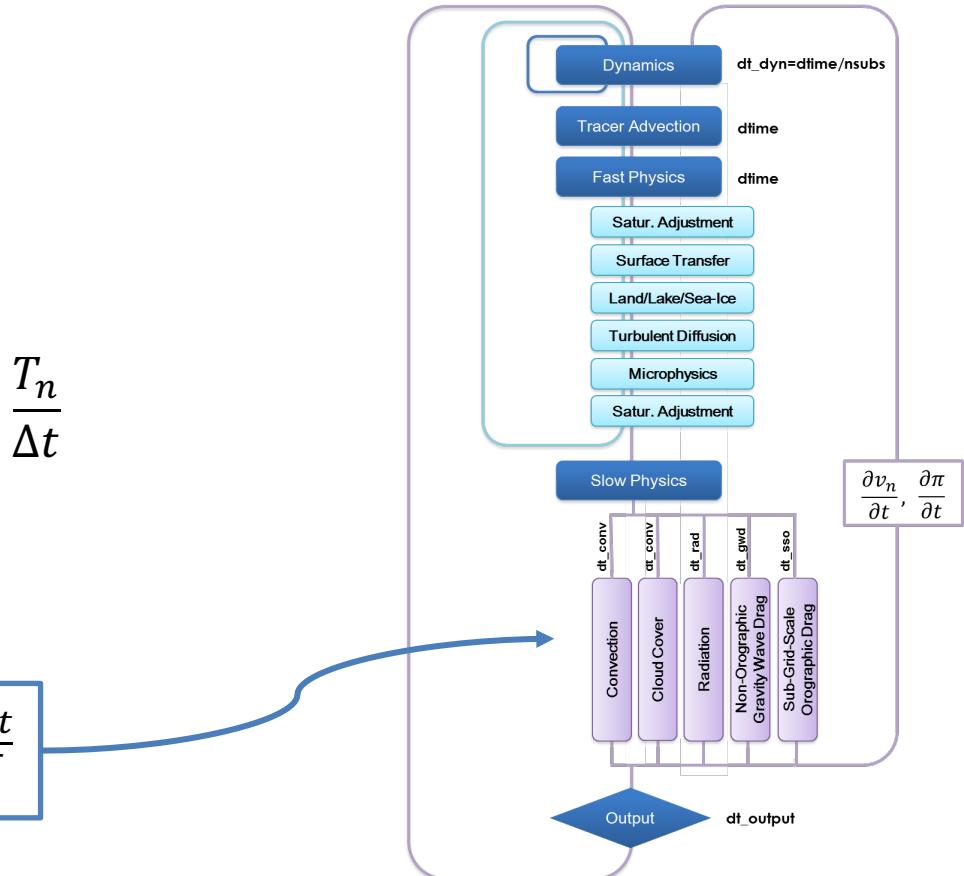
**explicit tendency:** 
$$\frac{T_{n+1} - T_n}{\Delta t} = \frac{T_x - T_n}{\tau}$$

**implicit tendency:** 
$$\frac{T_{n+1} - T_n}{\Delta t} = \frac{T_x - T_{n+1}}{\tau}$$

$$\frac{T_{n+1} - T_n}{\Delta t} = \frac{T_x + \frac{\tau}{\Delta t} T_n - T_n}{\tau + \Delta t} - \frac{T_n}{\Delta t}$$

**analytic tendency:** 
$$\frac{dT}{dt} = -\frac{c}{\tau} e^{-\frac{t}{\tau}}$$

$$\frac{T_{n+1} - T_n}{\Delta t} = \frac{T_x - T_n}{\tau} e^{-\frac{\Delta t}{\tau}}$$



# dephy for ICON - issues

ICON dephy SCM input simulations give virtually identically results to ICON customary format (ARM).

## Further issues with dephy format:

- **native mode:** half & full levels, model variables (e.g.  $\theta_v, \pi, v_n$ )
- **soil model:** moisture & temperature (initial and nudging) & surface/soil parameters (e.g. soil type)
- **ocean (e.g. mixed-layer):** temperature & salinity
- **switches:** attributes in SCM file (overwritten by model namelist)
- **missing variables:**  $q_{v,sfc}$ , ozone, time-varying  $w$ , surface drag coefficients  $C_m, C_h, C_q$

## Already raised issues:

- support CF convention names and similar descriptive names for other variables.
- $T_{surface}$  could be  $T_{skin}$  or  $T_{ground}$  – need to be specific or have both