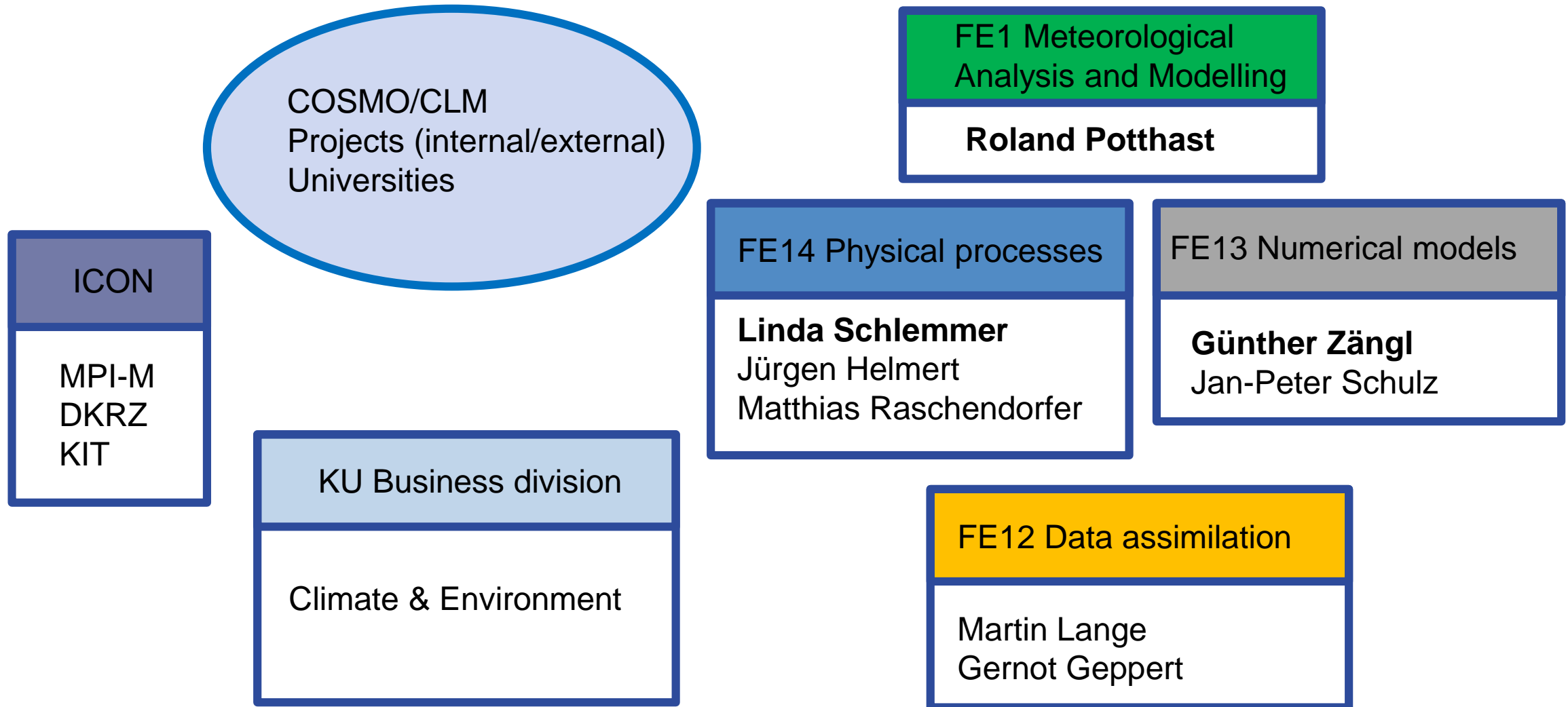


TERRA developments at DWD

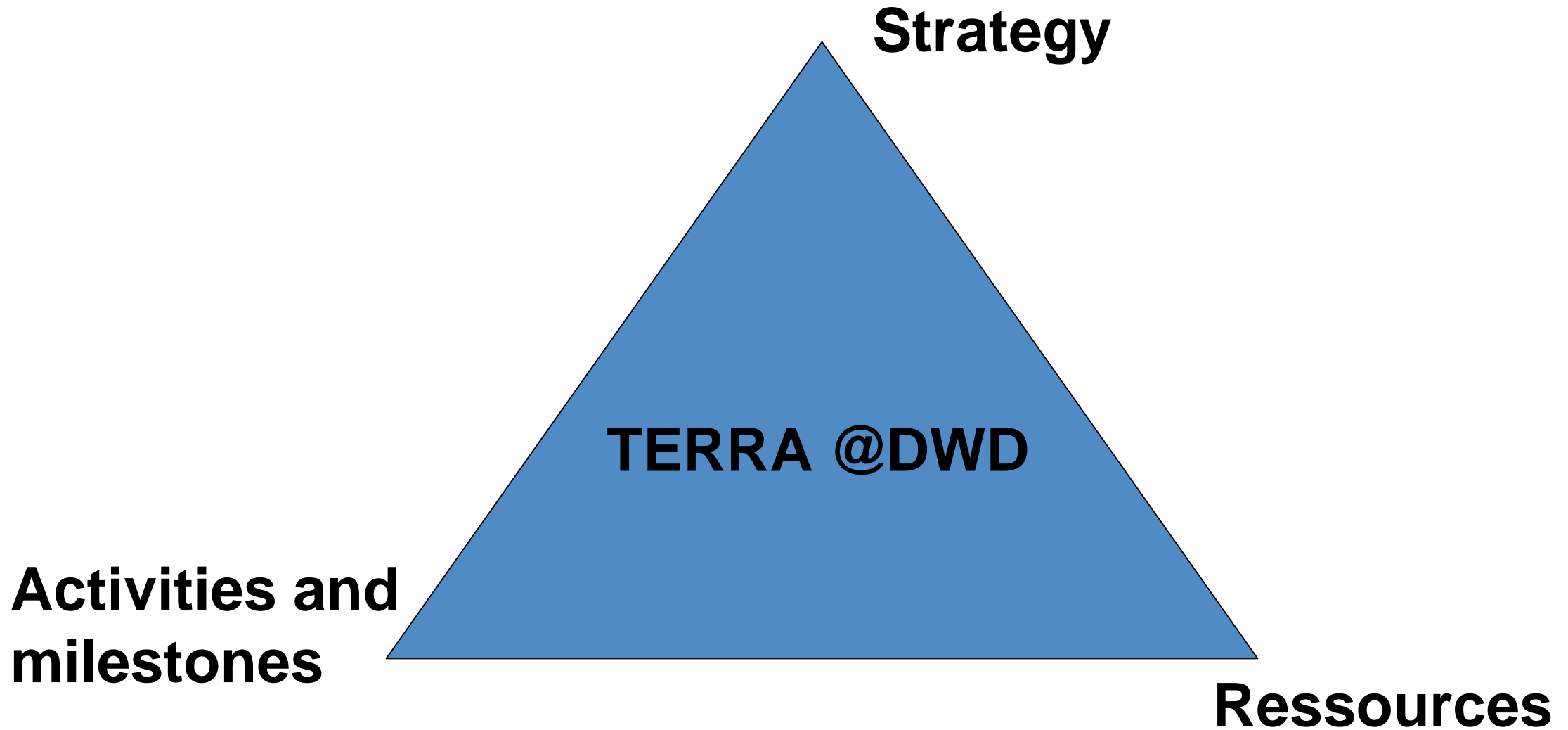
TERRA @ DWD and partners

Deutscher Wetterdienst
Wetter und Klima aus einer Hand



Major activities and milestones for TERRA @DWD

- Strategy of the DWD
- Science plan
- Requirements by applied forecast range in DWD models
- Internal and external factors, committees, boards
- Coordination by head of department/units
- Available resources



Major activities and milestones during pandemic in 2020/Q1 2021:

- Migration from CRAY system to NEC
- Replacement of COSMO-D2 with ICON-D2

Physical aspects in relationship with COSMO WG3b:



The image shows a screenshot of the COSMO website. On the left, there is a vertical menu with a map of Europe highlighted in yellow and the text "Work Groups". To the right, the COSMO logo is displayed, consisting of the letters "COSMO" in a bold, 3D font, with a globe as the letter "O". Above the logo, it says "CONSORTIUM FOR SMALL SCALE MODELING". Below the logo is a horizontal navigation bar with the following items: "Work Groups", "Introduction", "Work Plan", "Meetings", "People", and "Home". The "Introduction" item is highlighted in yellow. Below the navigation bar, the text "Work Group 3b: Physical aspects, Soil and Surface" is displayed in a white box with a black border.

Work Groups | **Introduction** | **Work Plan** | **Meetings** | **People** | **Home**

Work Group 3b: Physical aspects, Soil and Surface

Physical aspects: Hydrology

- PhD at ETHZ to **improve COSMO/TERRA (hydrology)**, 2018 - 2020
 - [Overview](#), [status 03.2019](#), [status 01.2020](#), [EGU 2020](#)
 - Daniel Regenass has started in December 2017 a PhD in the group of Prof. Christoph Schär (project WEW-COSMO, directed by Linda Schlemmer).
 - Using [TERRA revised hydrology](#) introduced by Linda Schlemmer.
 - Development of a validation framework to assess the quality of individual LSM components using catchment based runoff measurements
- BTU, Andreas Will (see [here](#))
 - Introduce support for **vertically inhomogeneous soil types** (e.g. from HWSD or BUEK 200 data set) by re-writing the Richards equation.
 - Plan also to use percentage of basic soil components instead of discrete soil types.
- Linda Schlemmer is head of the unit FE14 „Physical Aspects“
- Coordinating work on TERRA hydrology/hydraulic budget with consideration of TILE structure in ICON



Physical aspects: Mire

MIRE parameterization (status, see also [WG work plan](#))

- Mire is an important soil type in large part of Russia, and a specific parameterization has been developed by Alla Yurova.
- TERRA-MIRE is available in COSMO v5.06 (itype_mire=1).
- Positive impact on wind gusts and PBL temperature in regions with significant fraction of mires.
- Current limitations: evapotranspiration, fixed water table, dry bogs not captured.
- **Work on external parameters needed, some resources could be provided by Russian colleagues.**
 - Ongoing work to overcome current limitations (dry/wet bogs, water table)
 - Achievements: Add ECCI land-use in EXTPAR 2020 (prerequisite)
 - ICON experiments reveal future requirements for operational usage
 - Switch to ECCI in ICON, adaption of surface data assimilation



Physical aspects: Canopy

- Development of **canopy layer** at DWD
 - Three parallel developments: J. Helmert (vegetation canopy and resistance formulation), J-P. Schulz (skin layer as in [Viterbo and Beljaars 1995](#)), and M. Raschendorfer (generalized roughness layer, see below)
 - The resistance formulation of the vegetation canopy is in particular able to capture the heating of the forest canopy ([Ch. Sgoff, 2017](#) - work in progress)
 - The skin layer development is available in TERRA / ICON and a **positive impact** (see in particular slides 19ff) on the amplitude of the diurnal cycle of the surface temperature is observed; also, the simulation of the heat urban island in Moscow region is much improved when switching the skin layer on. This is available in the latest official COSMO release and is now operational at DWD.
- Achievements: May 2020 NWP-System @DWD: Introduction of a new formulation of the surface temperature in TERRA: The skin temperature (J.-P. Schulz)



Connection to other COSMO activities:

- Cooperation with **AEVUS/CITTA** on urban model in ICON
- Cooperation with **SAINT** on implementation of a new snow pack model in ICON
- Cooperation with **VAINT** on implementation of a vegetation model in ICON
- Cooperation with **EXTPAR** on implementation of new external parameters

Questions? Discussion ...