WP3 – Improved Land Surface Data and Deposition Fluxes

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Outline

- Motivation
- Work Package concept
- Objectives
- Technical, scientific, and service advancements
- Innovation potential
- Links to other work packages
- 6-month plan
- Open questions
- Questions and discussion

Motivation

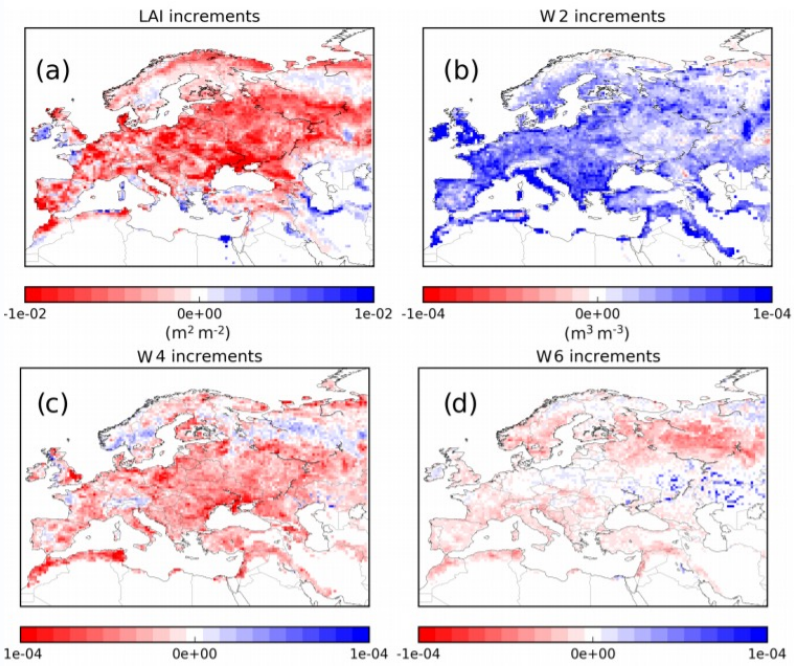
- Dry deposition of pollutants has an important impact on crops (ozone) and eutrophication (nitric acid and ammonia).
- Availability of satellite observations of the land surface give the opportunity to exploit new data sources to improve our knowledge of dry deposition processes.
- Advancements in land surface modelling allow for a more realistic and tighter connection between land-surface processes and the atmosphere.
- Strong need from within the CAMS user community for data products related to dry deposition.

Work Package 3 Concept

- Develop a dry-deposition add-on service to CAMS that combines:
  - All available satellite observations
  - State of the art land surface modelling
  - Recent advancements in dry deposition modelling
  - Land surface-data assimilation.
- Aim to deliver new dry deposition products and services that complement the existing CAMS data product portfolio and expand uses into new market areas.
- We develop a pathway towards operationalisation of the tools and data products.

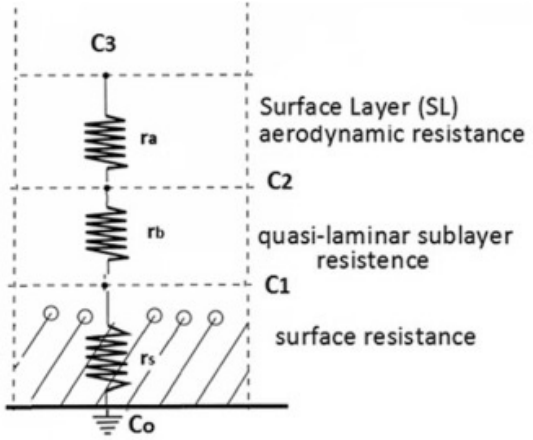
Objectives and Work Package Tasks and Deliverables

- **Task 3.1**: Generate data products (forecasts and data assimilation analyses) of soil moisture and leaf area index over the CAMS European domain.



Albergel, et al.: Sequential assimilation of satellite-derived vegetation and soil moisture products using SURFEX_v8.0: LDAS-Monde assessment over the Euro-Mediterranean area, Geosci. Model Dev., 10, 3889-3912, https://doi.org/10.5194/gmd-10-3889-2017, 2017.

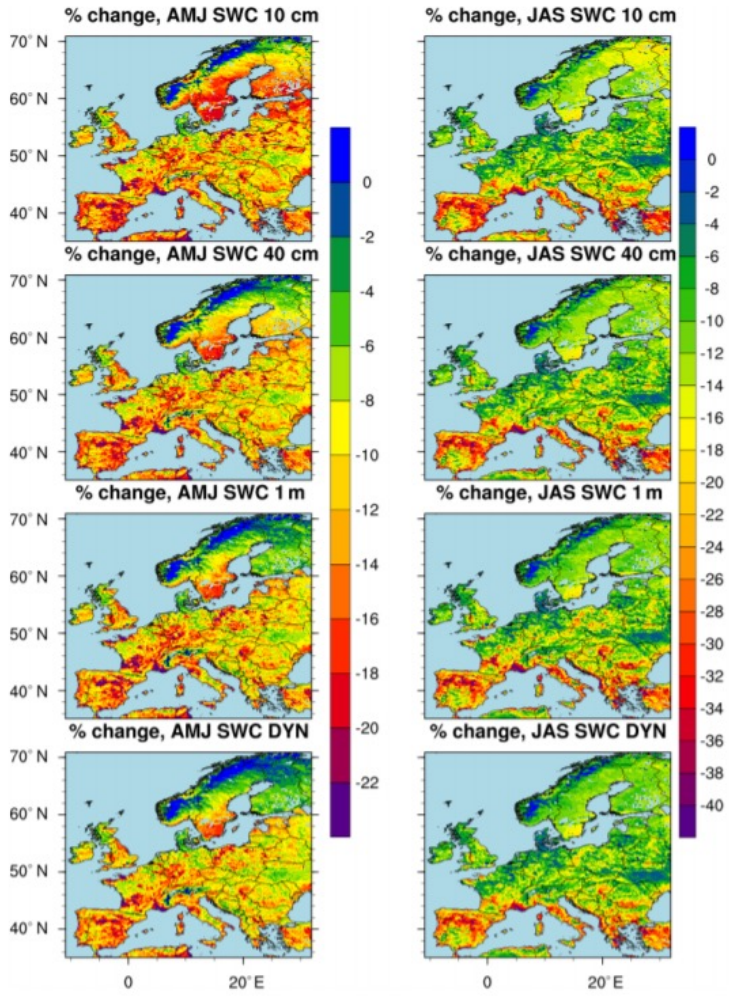
- **Task 3.2**: Evaluate land surface data products from Task 3.1.
- **Task 3.3:** Develop a dry deposition scheme implemented directly within the state-of-the-art land surface model SURFEX.



Objectives and Work Package Tasks and Deliverables

- **Task 3.4**: Generate maps of dry deposition velocities and diagnostics (e.g., stomatal conductance, resistances, etc.) for key pollutants over the CAMS European domain.

- **Task 3.5**: Estimate deposition fluxes of key pollutants, e.g., ozone, nitric acid, and ammonia, over the CAMS European domain.



Anav, et al.: Sensitivity of stomatal conductance to soil moisture: implications for tropospheric ozone, Atmos. Chem. Phys., 18, 5747–5763, https://doi.org/10.5194/acp-18-5747-2018, 2018.

Key advancements

- A new dry deposition scheme designed to link to all nine of the regional CAMS models;
- Coupling of the dry deposition scheme with an advanced land surface model including dynamic and realistic plant phenology
- Estimation of the dry deposition fluxes and diagnostics at the land cover patch type scale in SURFEX including water bodies
- Dry deposition scheme within SURFEX will be coupled with the SURFEX LDAS-MONDE data assimilation analyses key land surface variables;
- Improved estimation of the land surface classification within the CAMS European regional domain;
- Provision of dry deposition products for users in downstream applications.

Innovation Potential

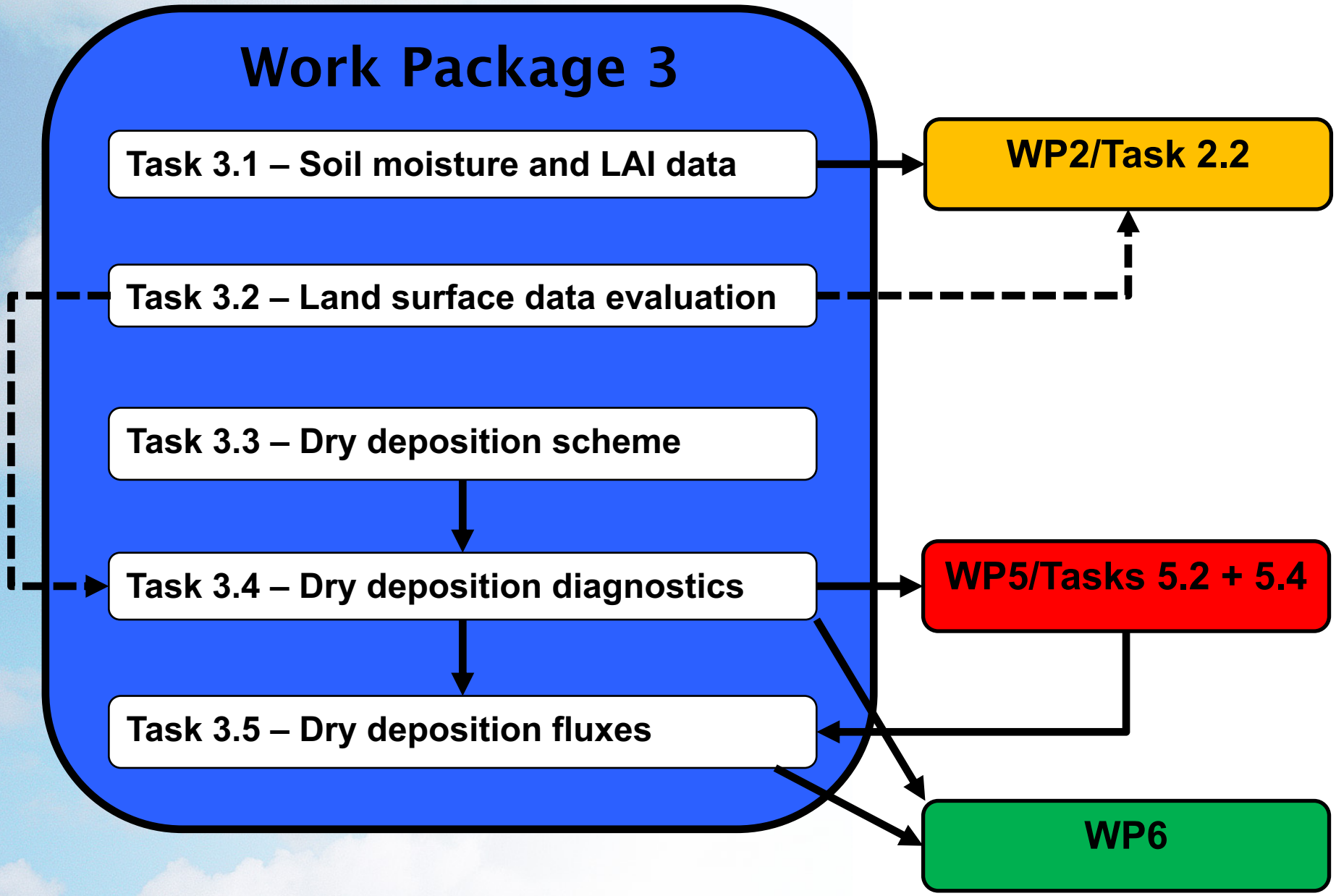
- New dry deposition products delivered to downstream services, new markets, and policy areas.

- Linking ozone uptake in plants with dynamic simulations of plant phenology and shorter-term variations in stomatal conductance that vary according to photosynthesis.

- Estimating nitrogen deposition over water bodies to support management of eutrophication problems.

- Delivery of dry deposition products at the patch scale:
  - Land classification scale
  - Equivalent to spatial resolutions of either 1 km^2 or 300 m^2.

Links to Other Work Packages



6 Month Planning

2021 – Key Deliverable

‘Dry deposition scheme software implemented within the open source SURFEX model’

Key Work Components:

- Scientific review and planning
- Verification of required outputs from Task 3.1.
- Mapping out connections between WP3 and user needs in WP6.
- Coding
- Monthly progress review
- Testing within SURFEX offline system at NILU
- Testing with open-loop, forecast, and analysis
- Merging with operational SURFEX code

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- This is a crucial piece of work that needs to be delivered in a timely manner by the end of 2021.
- We plan to assign at least 7 person months from WP3 to this task/deliverable in 2021.

Open Questions for Discussion

- How to manage required outputs from SURFEX in relation to links to:
  - WP2 – Outputs from SURFEX required to link to BVOC emission calculation
  - WP5 – Outputs from SURFEX required by the MOCAGE CTM for testing
  - WP6 – Outputs from SURFEX required by stakeholders to SEEDS
- Is there a possibility of using MEGAN directly integrated within SURFEX?

Questions?