EGU General Assembly 2020

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- Plastics in terrestrial ecosystems -

SFB MIKROPLASTIK

Microplastic enhances water repellency of soils

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1. Contact angle measurements

- Testing mixtures of MP and model porous media by applying the Sessile Drop Method
- Contact angles were measured and show an increase with rising MP concentration

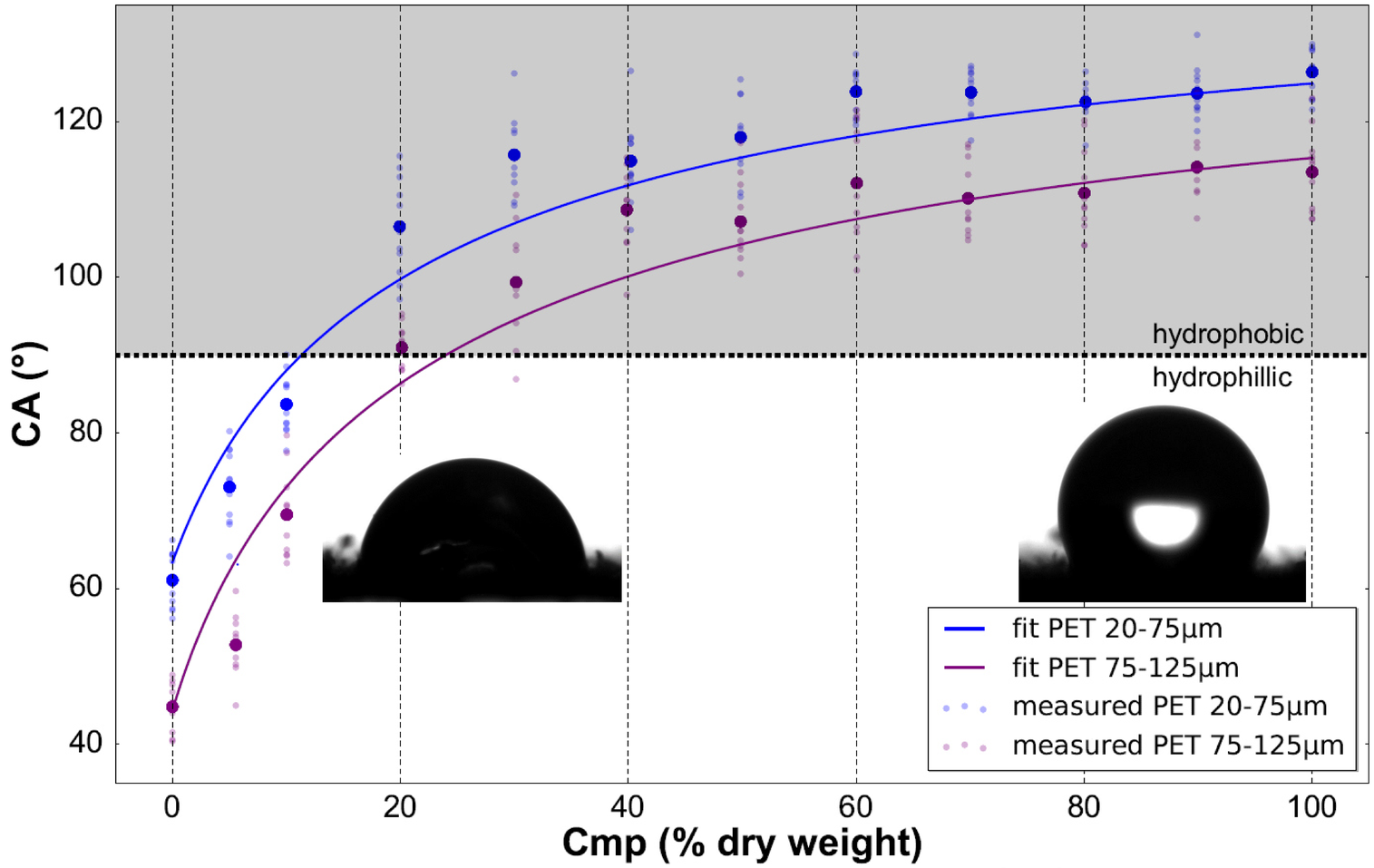
2. Modelling

- Extended model for composite surfaces
- Differentiation between surfaces building up the apparent contact angle
- Base:

$$cos\,\Theta_e^{net} = \varphi \cdot cos\,\Theta_w - (1 - \varphi)$$

Bachmann & McHale 2009

$\cos\Theta_e^{net}$ = observed contact angle
φ = solid fraction (Cassie)
Θw = contact angle (Wenzel)



Response of the apparent contact angle (CA) to increasing concentrations of microplastic (Cmp) for two size fractions shown exemplary for PET and the fitted respective model. Already in low concentrations of MP the contact angels exhibit a steep increase and are rapidly reaching areas of hydrophobicity (CA > 90°).

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3. Model as tool for extrapolation

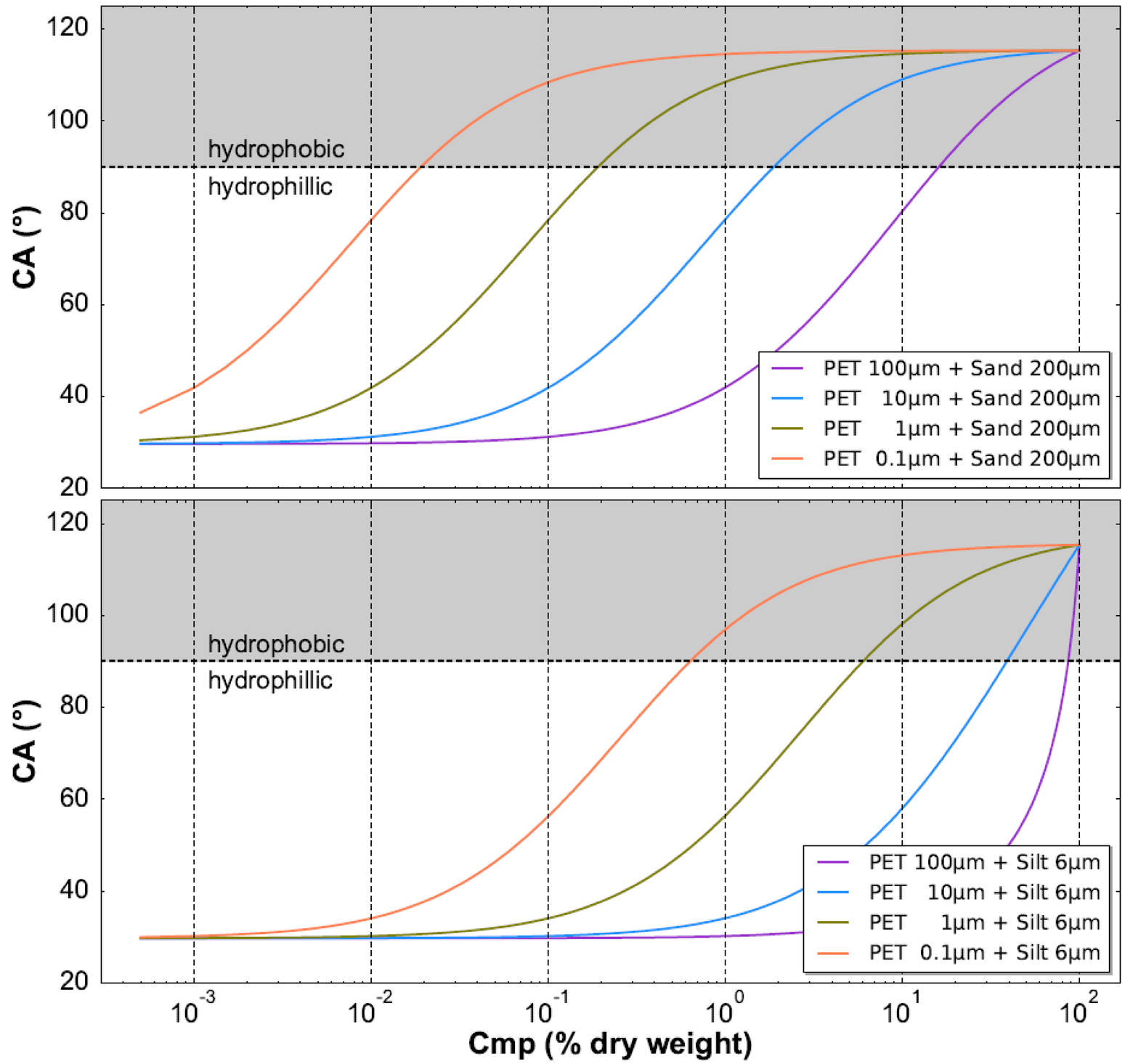
- Possibility of varying parameters
- Diameter, density, concentration and distance of particles

4. Conclusion

- Soil water repellency can be induced even at low concentrations of MP
- Increasing the difference in grain sizes pronounces the hydrophobic effect
- Induced by large particle numbers of MP and the corresponding increase in specific surface area

5. Impact

- Change in water flow pathways
- Change in liquid configuration of porous media
- Inhibited transport?
- Inhibited biodegradation?



Modelled response of the contact angle to increasing concentrations of MP. The contact angles were modelled by applying varying sizes and concentrations of the involved media. Exemplary the grain sizes for sand and silt in the upper range of the fine fraction are shown.