UP 8: Hydrosphere, Soil and Agricultural Physics

Time: Wednesday 14:15–15:15 Location: H41

Invited Talk UP 8.1 Wed 14:15 H41

Niederschlagsmessung mit Richtfunkstrecken kommerzieller Mobilfunknetzwerke — •Harald Kunstmann[1,2], Christian Chwala[1] und Felix Keis[1] — [1]Karlsruher Institut für Technologie, Campus Alpin, Garmisch-Partenkirchen — [2]Universität Augsburg, Augsburg

Die exakte Erfassung der raumzeitlichen Niederschlagsvariabilität bleibt eine Herausforderung: die Interpolation zwischen Niederschlagsstationen kann gerade im komplexen Gelände oder bei geringen Stationsdichten zu großen Unsicherheiten in der Niederschlagsbestimmung führen. Ebenso bleibt die Ableitung von Niederschlagsmengen aus Radarreflektivitäten für hydrologische Anwendungen häufig problematisch. Neben diesen beiden klassischen Punkt- und flächenhaften Niederschlagsmessungen (Station und Radar) gibt es zusätzlich die Möglichkeit linienintegrierte Werte für Niederschlagsmengen zu erhalten. Dies wird ermöglicht über die niederschlagsinduzierte Abschwächung (Dämpfung) der Mikrowellensignale im Bereich zwischen 10 und 40 GHz, ein Frequenzbereich wie er bei den Richtfunkstrecken der Mobilfunkbetreiber eingesetzt wird. Wir präsentieren Analysen für den alpinen Raum der Region Garmisch-Partenkirchen und unser neu entwickeltes Erfassungssystem, das den direkten Zugriff auf beliebige Mengen von Strecken des jeweiligen Netzes (hier Ericsson) ermöglicht. Das System erlaubt erstmals Daten in Echtzeit für die wissenschaftliche Auswertung und könnte in Zukunft für flächendeckende Anwendungen auch im Nowcasting Bereich verwendet werden.

UP 8.2 Wed 14:45 H41

Evaluation of short-term noble gas fluctuations in groundwater and soil air in a two year study — •Simon Mayer, Florian Jenner, Therese Weissbach, and Werner Aeschbach — Institut für Umweltphysik, Heidelberg, Germany

The application of noble gases (NGs) in environmental tracer studies such as noble gas temperature (NGT) determination based on the temperature dependent dissolution of NGs in groundwater requires an exact knowledge of subsurface soil air composition. While deviations of soil air NG partial pressures from atmospheric values have already been found, an impact on NG contents of groundwater has not been investigated so far. We provide the first long-term study of NGs and physical parameters in both the saturated and unsaturated soil zone, sampled continuously for more than 2 years near Mannheim (Germany). Results show that NG partial pressures in soil air correlate with the sum value of O_2+CO_2 and thus differ seasonally from atmospheric values with an enhancement during summer time. Such soil air composition records allow to improve the reliability of NGTs in groundwater. There is evidence for a smoothing of short-term NG fluctuations in shallow groundwater within a few meters of increasing soil depth. Data indicates a further continuous equilibration of groundwater with entrapped air bubbles within the topmost saturated zone, even some years after recharge. Local subsurface temperature fluctuations may thus lead to subsequent variations of NG contents in groundwater, independent of the former recharge temperature, even though this effect is only relevant for shallow groundwater.

UP 8.3 Wed 15:00 H41

Drying in microfluidic cells as a model granular material — •Paolo Fantinel[1], Oshri Borgman[2], Wieland Lühder[1], Ran Holtzman[2], and Lucas Goehring[1] — [1]Max Planck Institute for Dynamics and Self-organization, 37077 Göttingen, Germany — [2]The Hebrew University of Jerusalem

We study the drying of porous granular materials on a microscopic scale in order to better understand drying mechanisms on the macroscopic scale. We aim to validate a 2D pore-scale model by experimental observations. The long-term goal is that of extending such class of models to real phenomena like water exchange between soil and atmosphere, invasion percolation and CO2 sequestration. To model a granular material we use microfluidic cells made of an array of round pillars, which represent the soil grains. The cells are open at one end to allow evaporation. We introduce different degrees of heterogeneity by changing the size and positions of the particles, as would be the case in a real, randomly packed, granular material. This heterogeneity can be random or vary over a given correlation length. We flood the cells with a wetting volatile fluid and observe them as they dry. After an initial phase where evaporation happens mainly at the surface, we see the formation of several isolated clusters of fluid which evolve further in time. In order to characterize the resulting patterns, we use three Minkowski measures. These give us information on roughness of the leading front, connectivity of the dry area and saturation of the sample. Microfluidic experiments are coupled with simulations in order to validate our pore-scale model.