**Catchment scale transport models**

**Lecturer: Markus**

1. *Where does water go when it rains?*

**Geographical source**

**Flow path: overland flow, preferential flow**

**Temporal source**

**Separation of spatial hydrograph (How old is the water running through)**

**Flow carries organic content to make water dirty during high peaks**

**Lot of dissolved irons**

1. *What controls the composition of water?*

**Physical**: shear stress; water cracks rocks(gravel, sand) points to how the soil formed;

**Chemical**: solutes in water (chemical saturation); mineral

Chemical weathering. Negative charges are absorbed by ion and get dissolved when all charges balance. CaCO3 is dissolved through carbon dioxide.

**Ion exchange/Adsorption**: H+ exchanges ions and brings soil particles.

**Biological**: organisms and vegetation;

1. *Tracers*

Tracers don’t change through the flood system; tracers move with the water system.

How the individual water molecule behaves and flood propagation because of the heterogeneity of parameters.

Isotope tracers: it changes neutrons but not element.

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Characteristic of stable water isotopes: **fractionation**

1. Temperature effect: rainfall becomes lighter as time because the heavy one falls first. Lighter water evaporates quicker.
2. Amount effect:
3. Continental effect: moving inland, the lighter the rainfall

Most plants worldwide uptake soil water instead of groundwater

Stream comes from first part groundwater and second part large pores.

1. *Hydrograph separation*

Water Mass balance and pollutant balance

Base flow: “old water, pre-event water”

Land flow: “new water, event water”

During event, large proportion of water into the stream are old water. Infiltration into the groundwater push out the old water stored underground.

1. *Transit and Residence times*
2. Dispersion (signal): 1. macro-scale dispersion: water go through soil particles due to different flow resistance. 2. water entering the system experiencing a time lag according to the relative distance.(**geographic dispersion**)

Convolution of the precipitation in terms of dispersion damps with time.(Fundamental)

**Assumptions:**

Transit times for groundwater only.

Transit time remains constant with time (once the soil gets saturated the flow path will vary a lot and affect the transit time)

Groundwater dominated system, celerity and velocity have huge difference. Celerity stands for pressure wave. Wave front, c = U.

1. Diffusion