Isotopenhydrologie: im Rietholzbach und in der Welt

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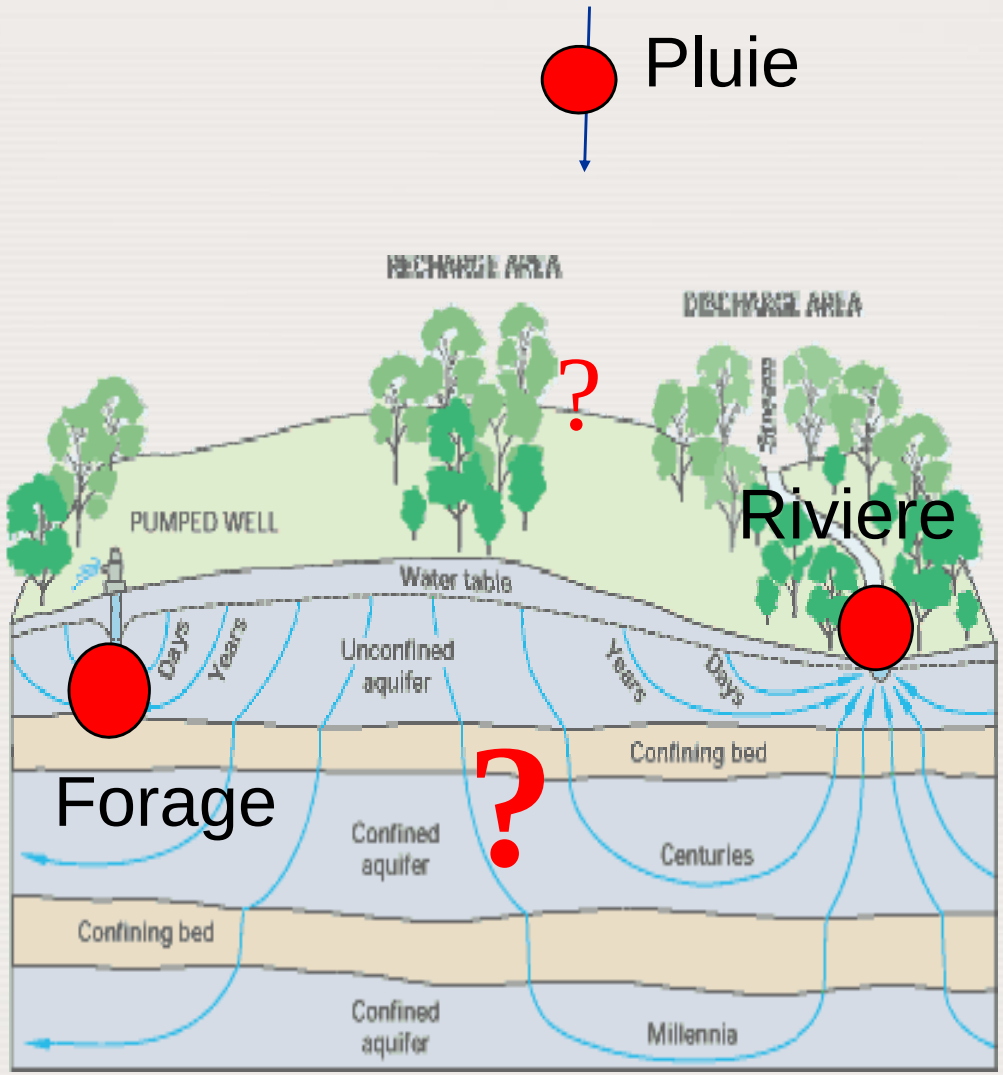
Warum befaßt sich die IAEA mit Wasser?

- IAEA deals with isotope techniques not only in muclear power/energy field, but also in agriculture, human health, marine environment,… and water resources

Techniques isotopiques = traçage d'eau



Traçage de:

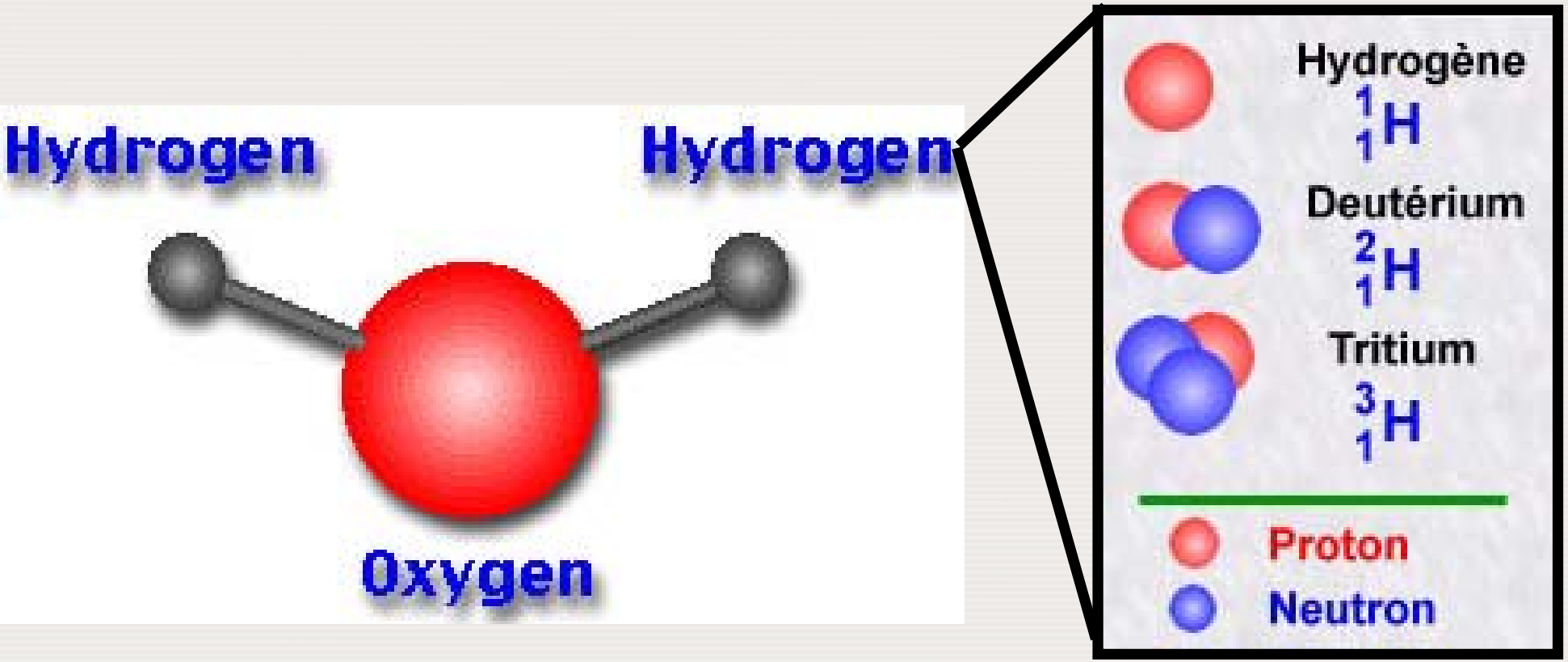
- Temps du sejour d'eau dans la nappe

-Chemins de contamination

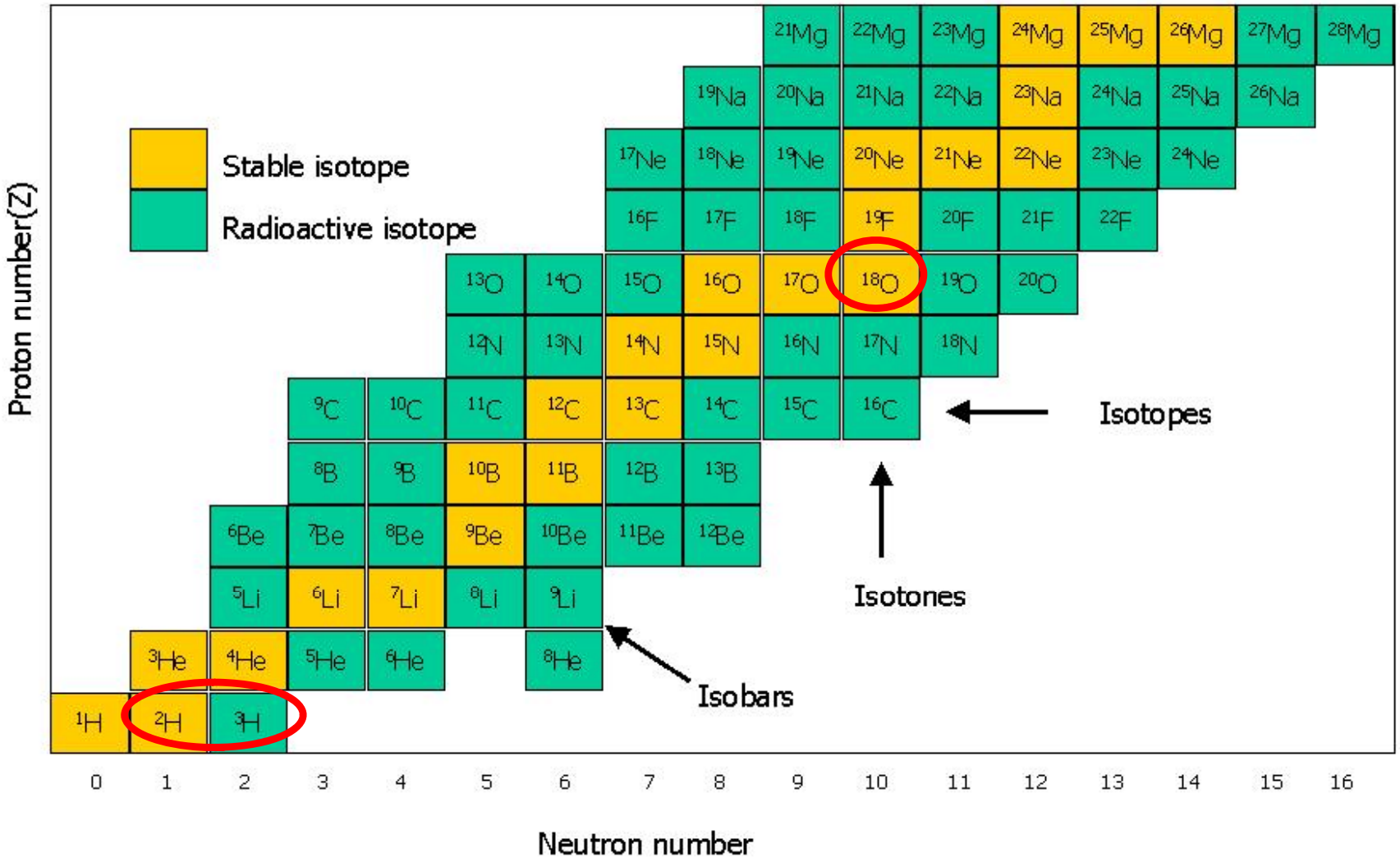
-Interconnexions hydrauliques

Ref: USGS

Water Molecule: Atoms of O and H

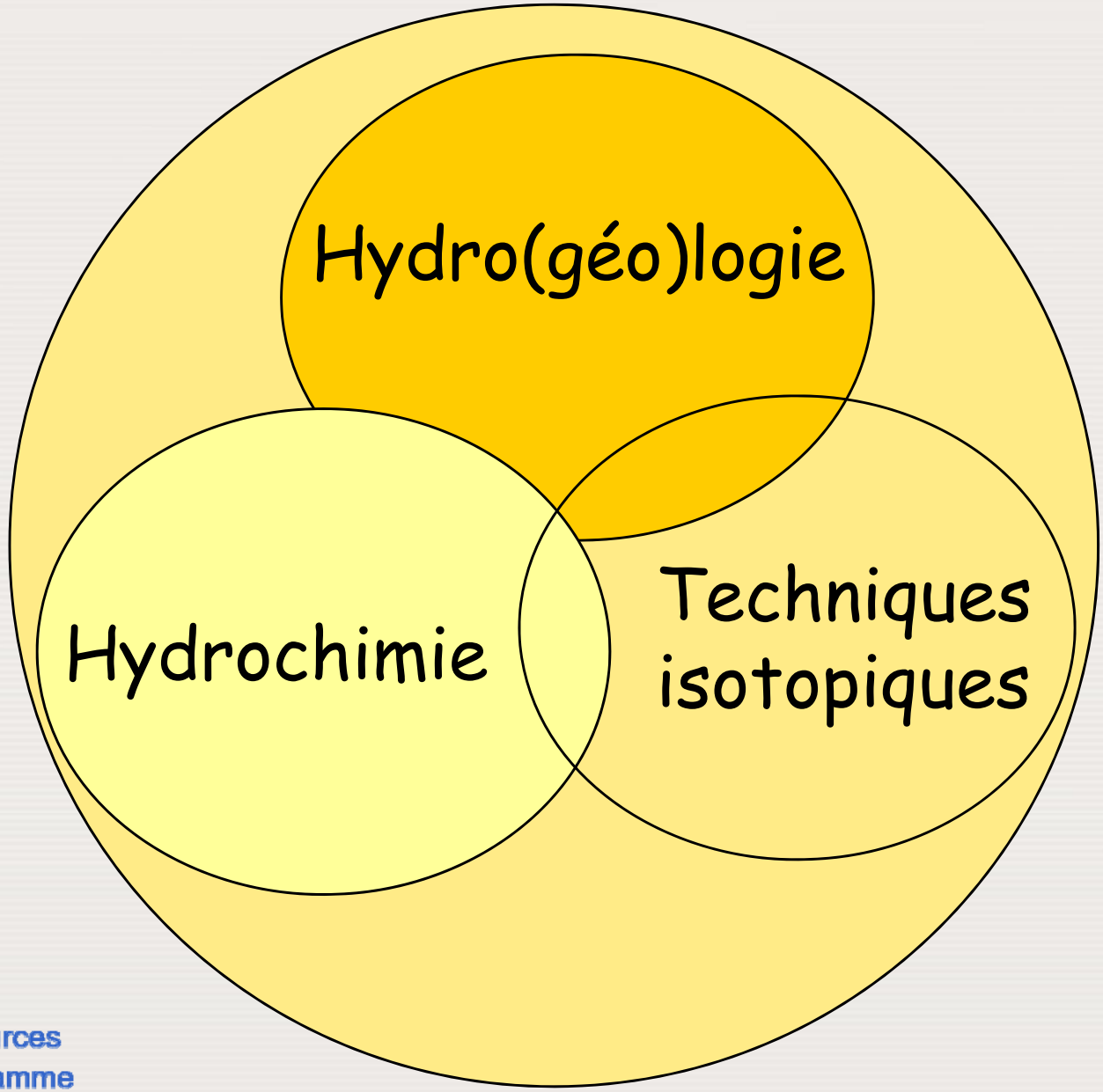


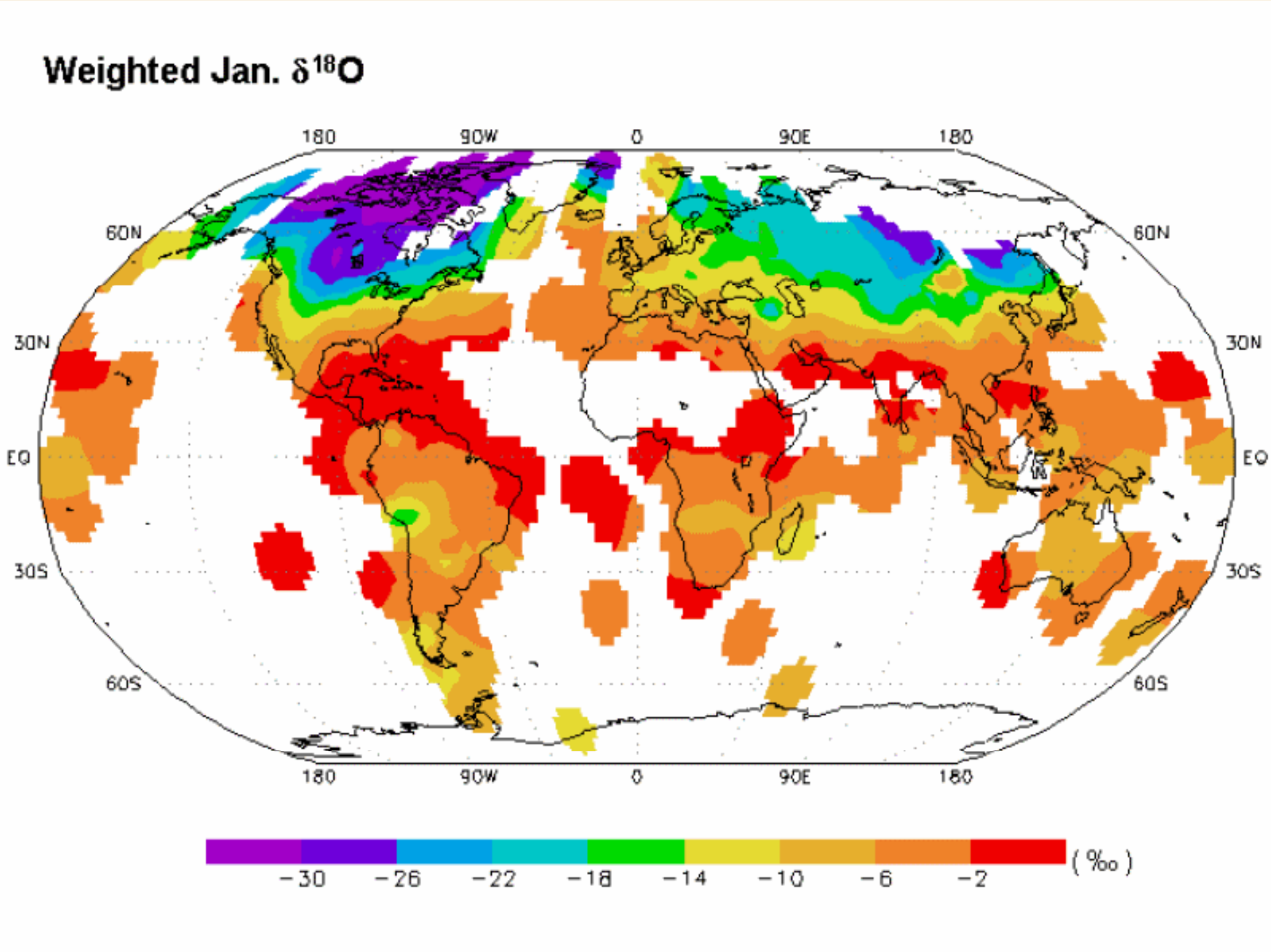
Ref: NASA and Webster's Dictionary



Isotopes = Species of an element with different number of neutrons. They can be stable or radioactive.

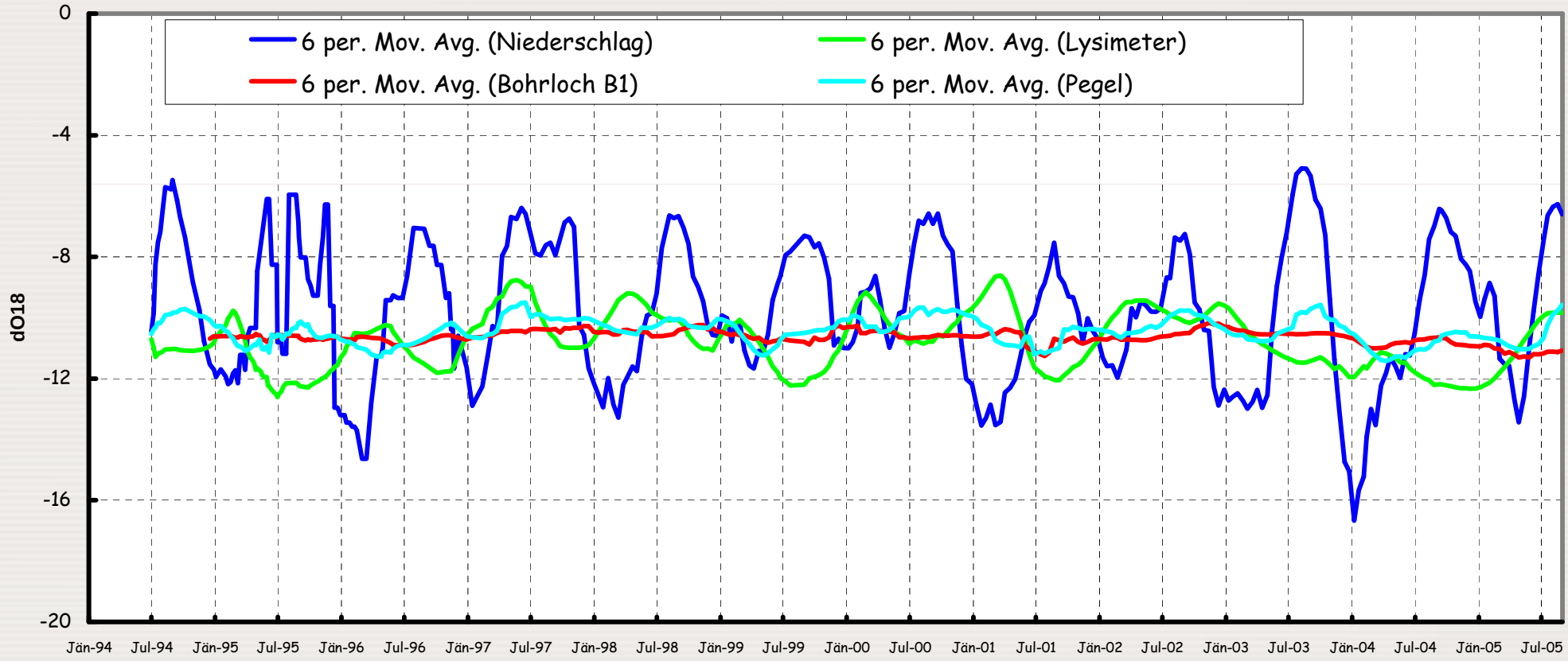
Complex Methodology




Weighted Jan. δ18O
180
90W
0
90E
180
60N
30N
EQ
30S
60S
−30
−26
−22
−18
−14
−10
−6
−2
(‰)

Ref. IAEA

O18 Rietholzbach 1994-2005



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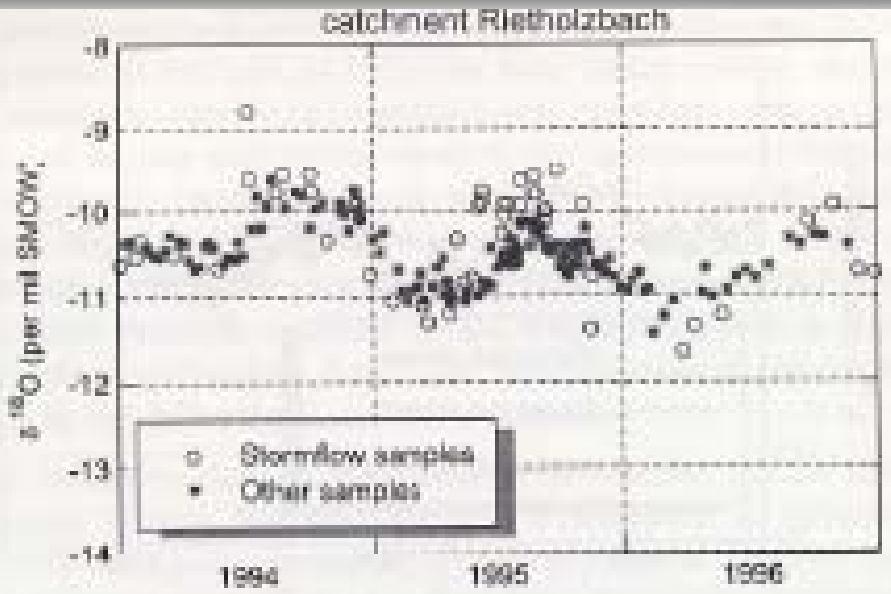
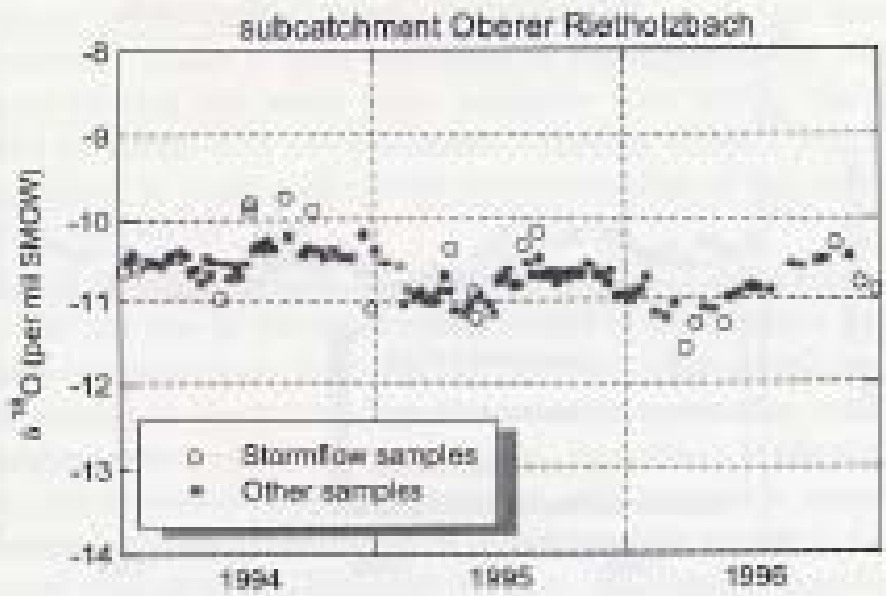
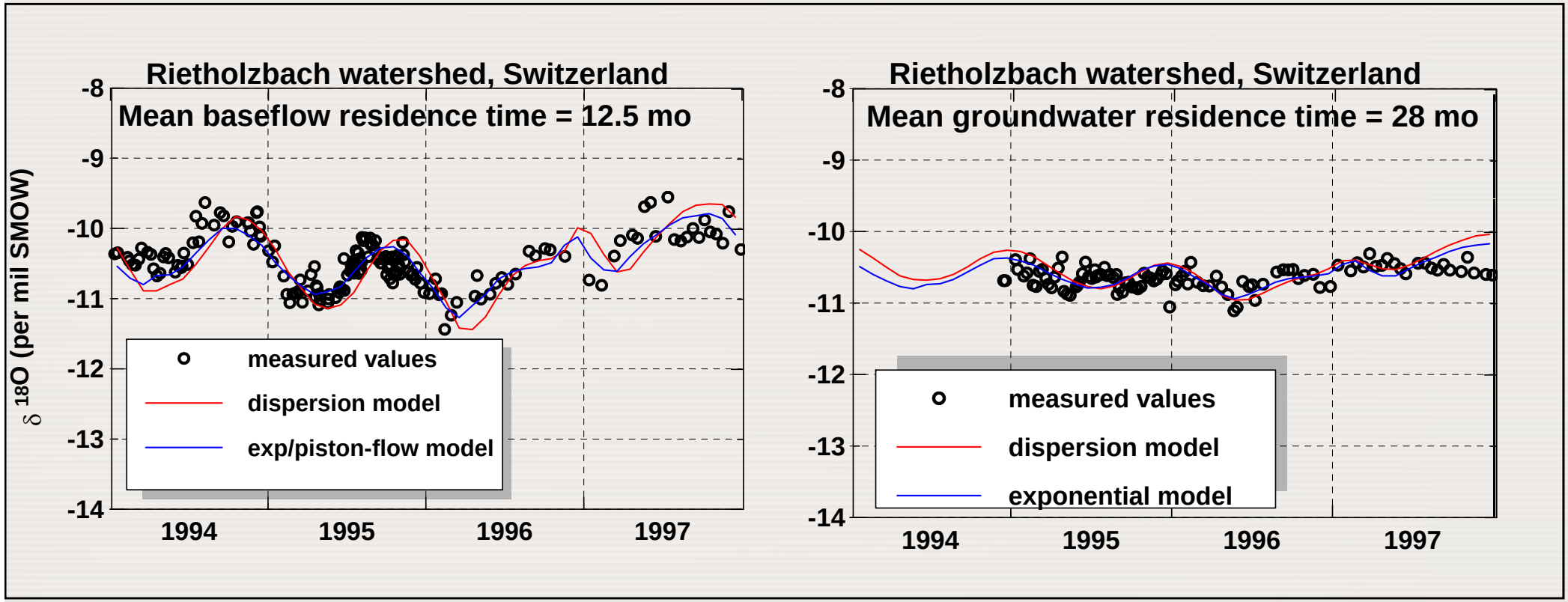
Rietholzbach – Fließgewässer 1994-1996





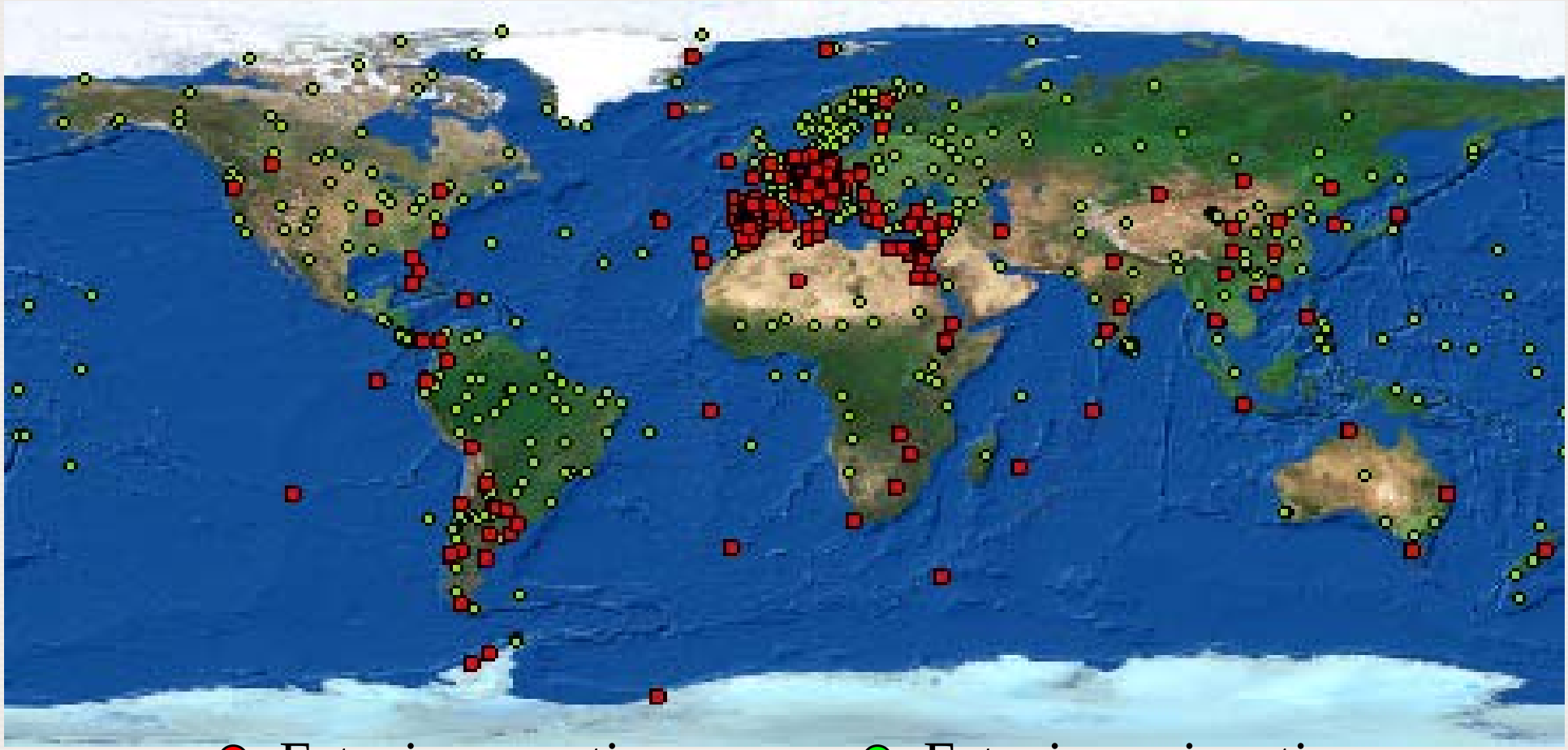
Rietholzbach-Modellierung von Verweilzeiten



Weltweit: Anwendungsbeispiele

- Global isotope data networks, verification of water balance models
- Paleoclimate
- Evaporation from surface waters
- Origin of precipitation/ air masses

GNIP - Global Network of Isotopes in Precipitation (Red Global de los Isótopos en Lluvia)



- Estaciones activas (183)
- Estaciones inactivas

2005

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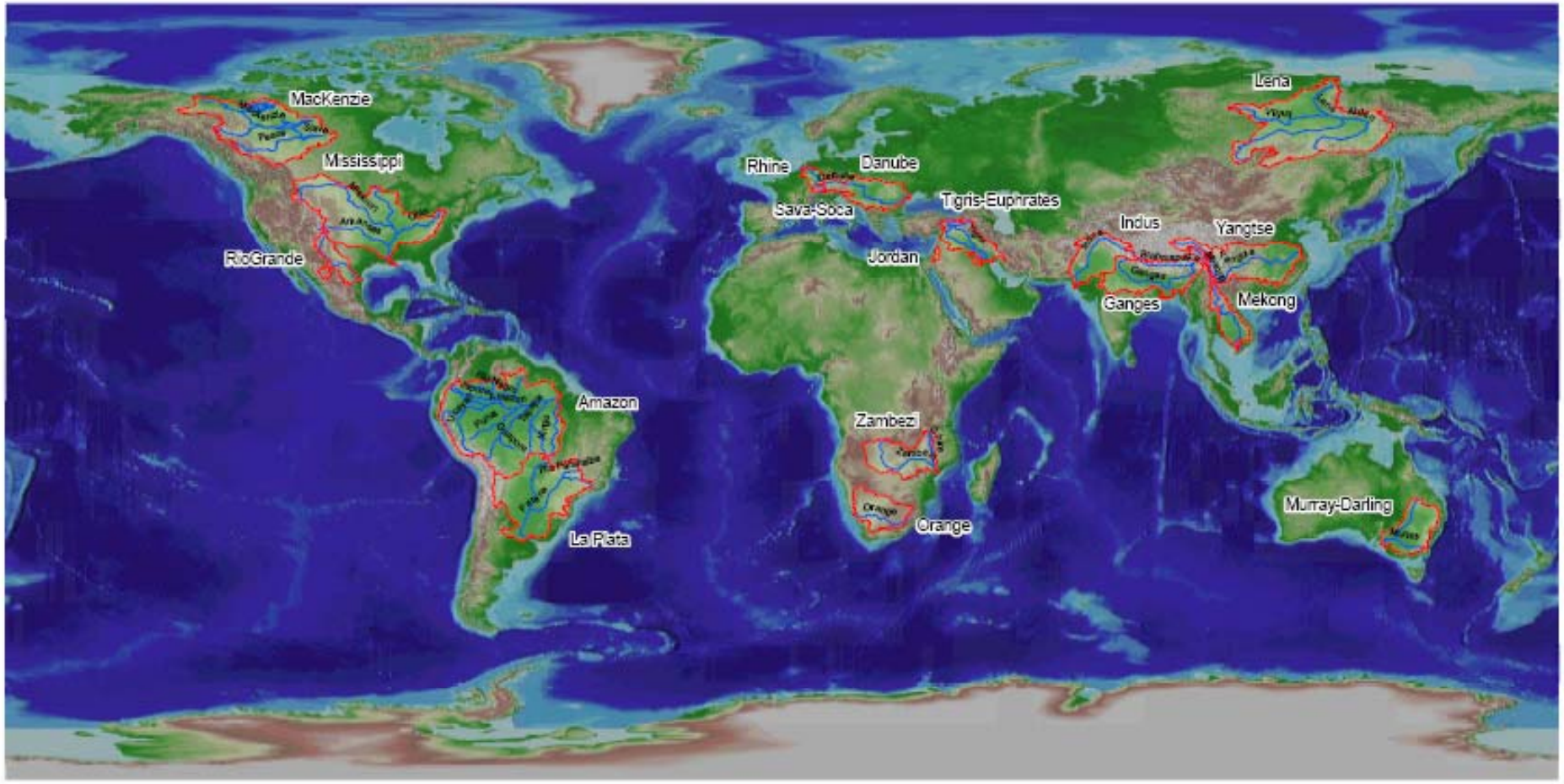
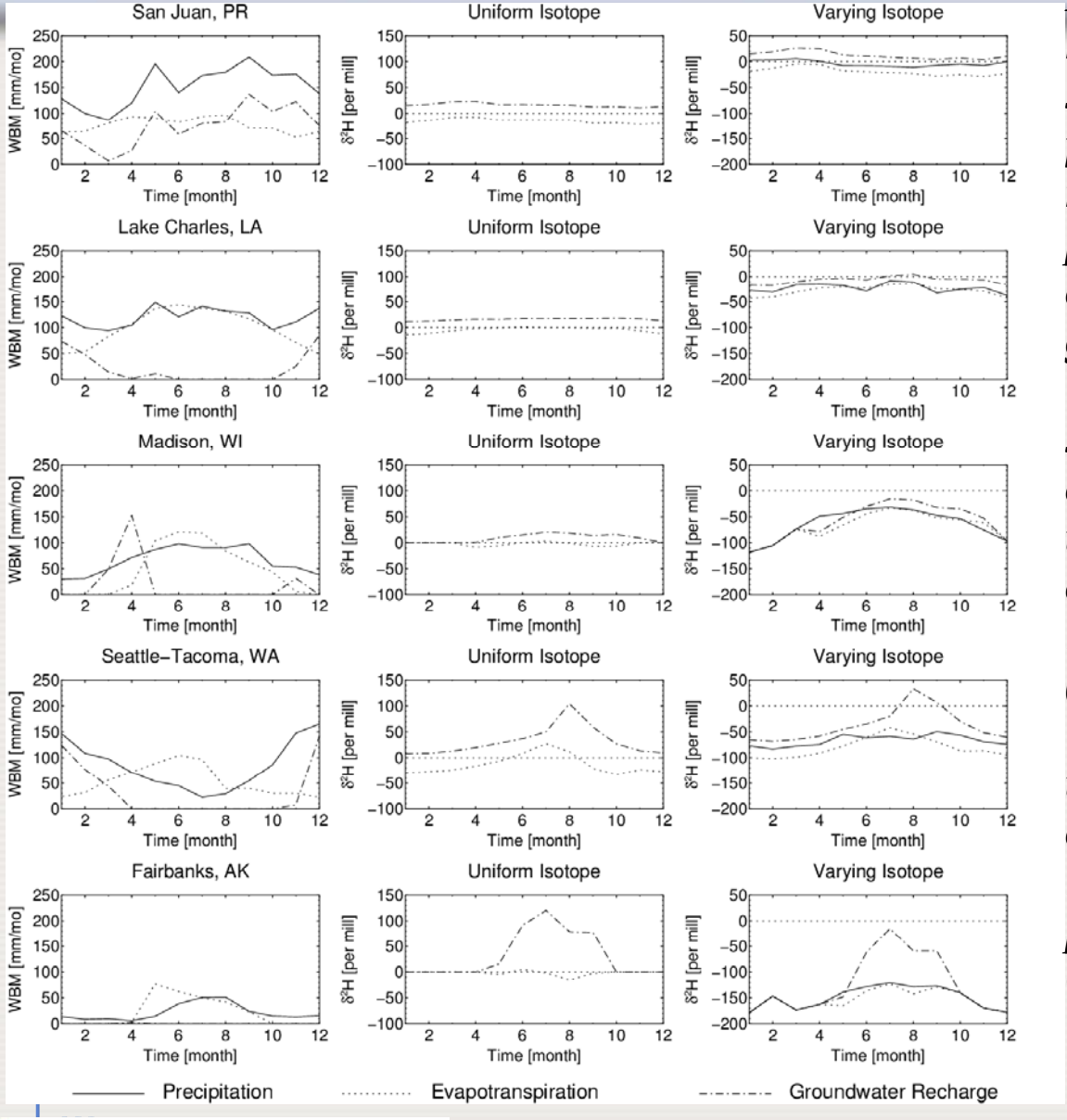
GNIR - Global Network of Isotopes in Rivers (Red Global de los Isótopos en Ríos) – a partir de 2007

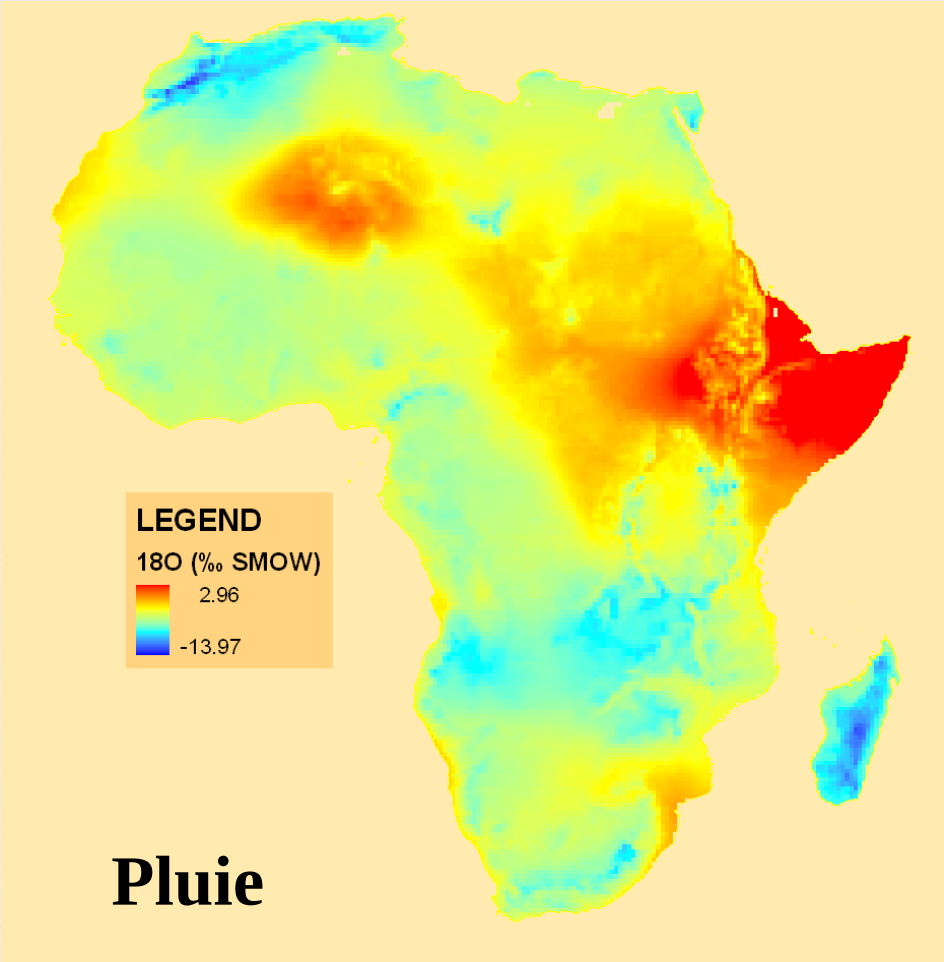


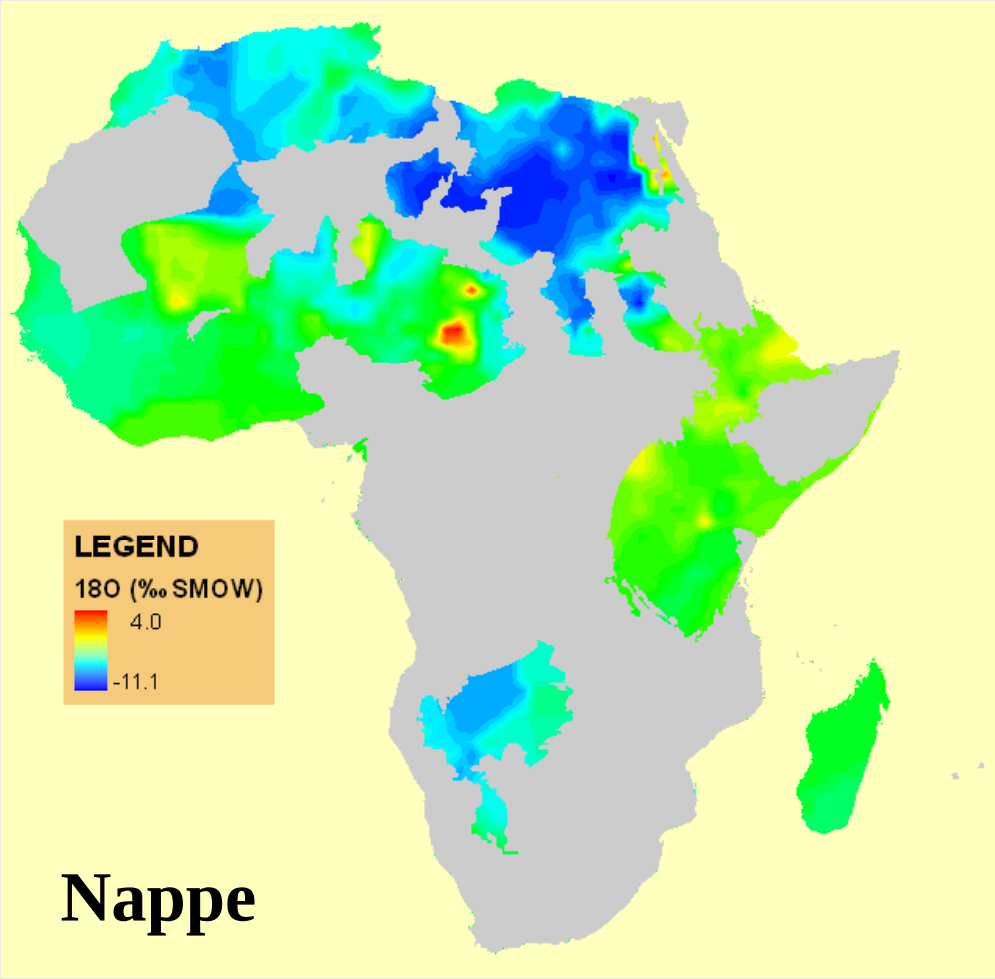
Isotope in Wasserbilanzmodellen



Isotope-enabled water balance model results at selected test sites. The first column shows the monthly regimes of input precipitation, estimated evapotranspiration and ground-water recharge. The second column summarizes the isotopic composition of the same three water balance components using isotopically uniform (VSMOW) precipitation. The third column shows the simulated isotopic composition under isotopically varying precipitation input (from GNIP).

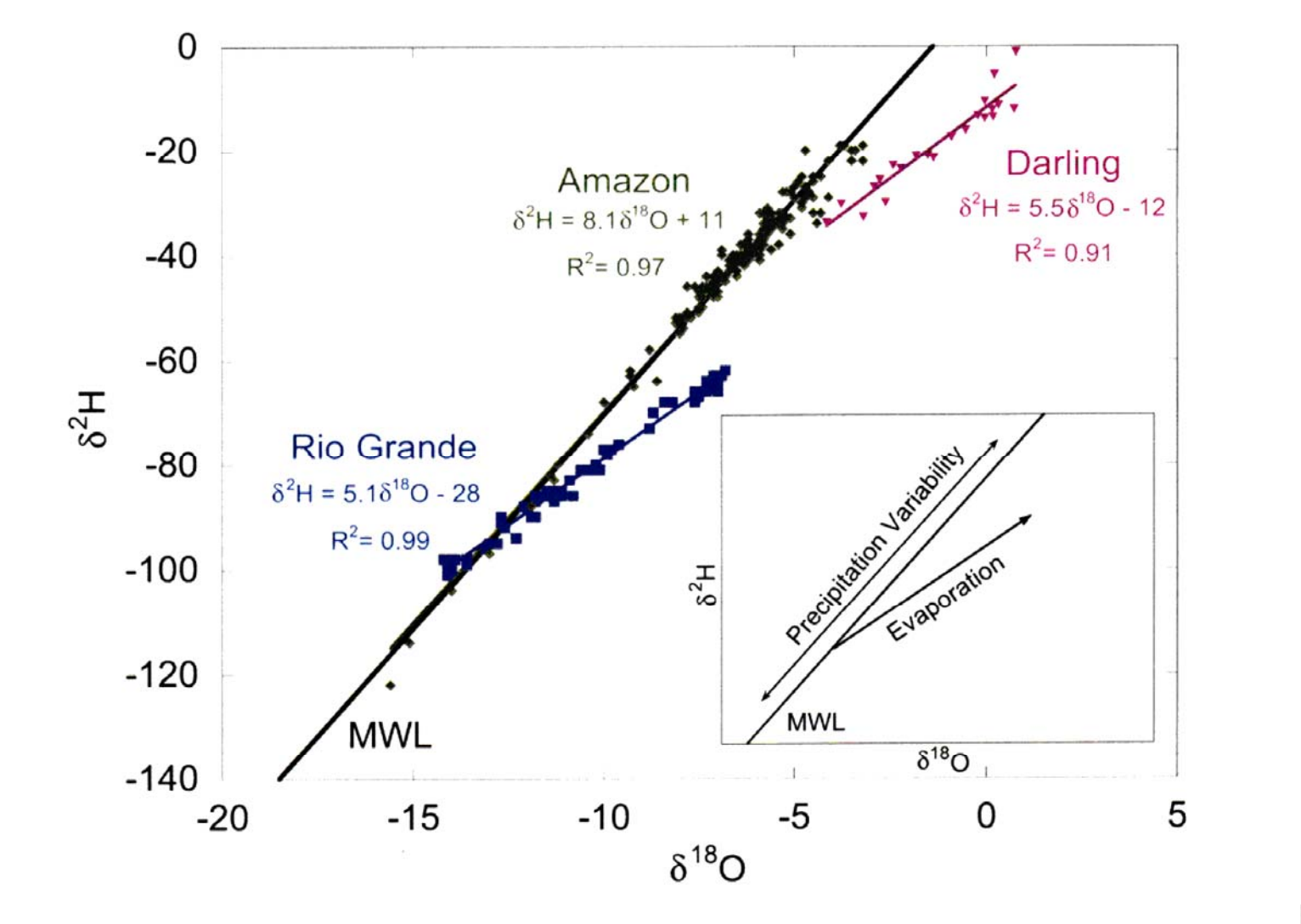
Palaeoklima





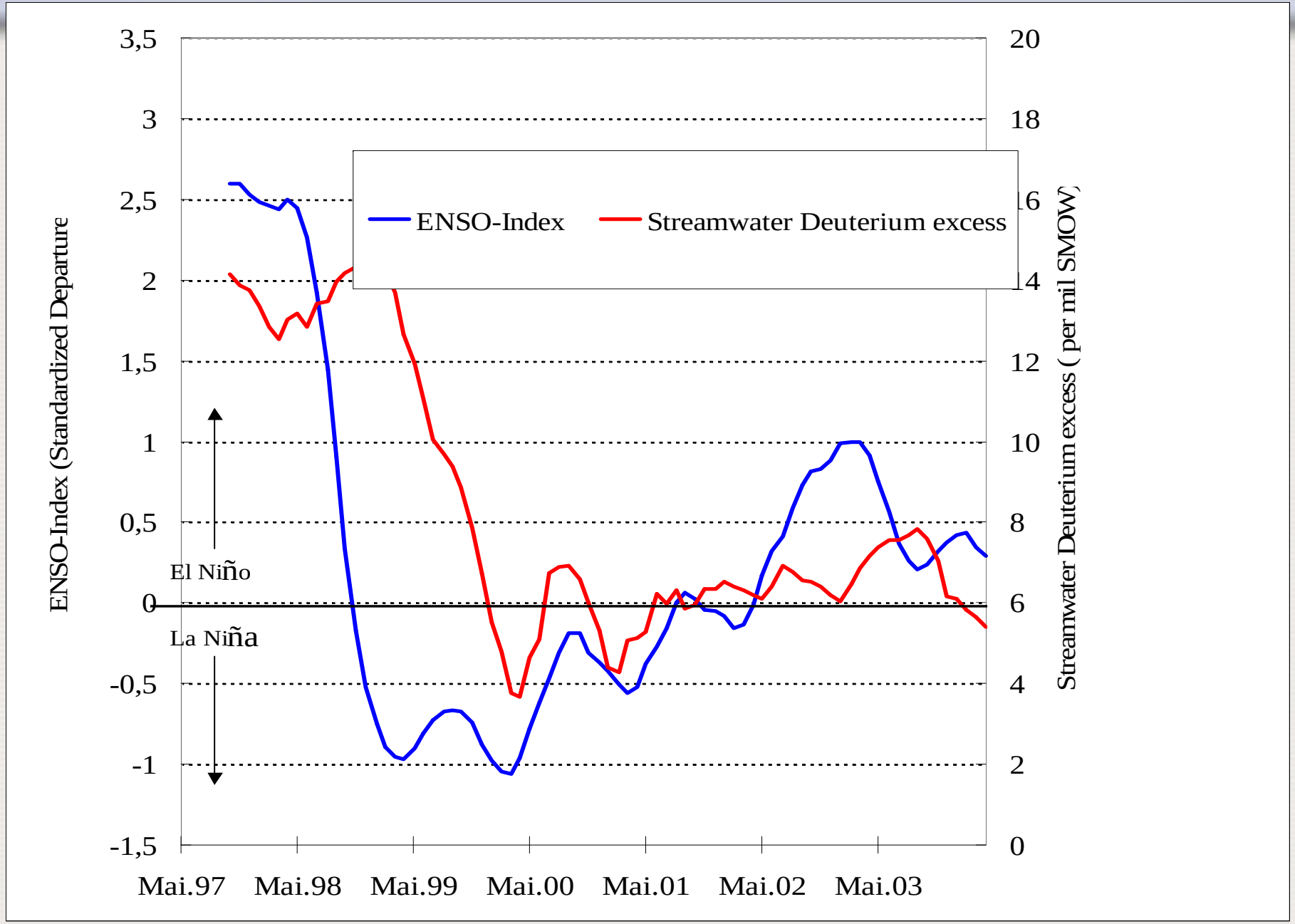
Contenu isotopique (O-18): Afrique

Evaporation von offenen Wasserflächen



Ref: IAEA

Herkunft von Regen im Flußwasser – Parana, Buenos Aires



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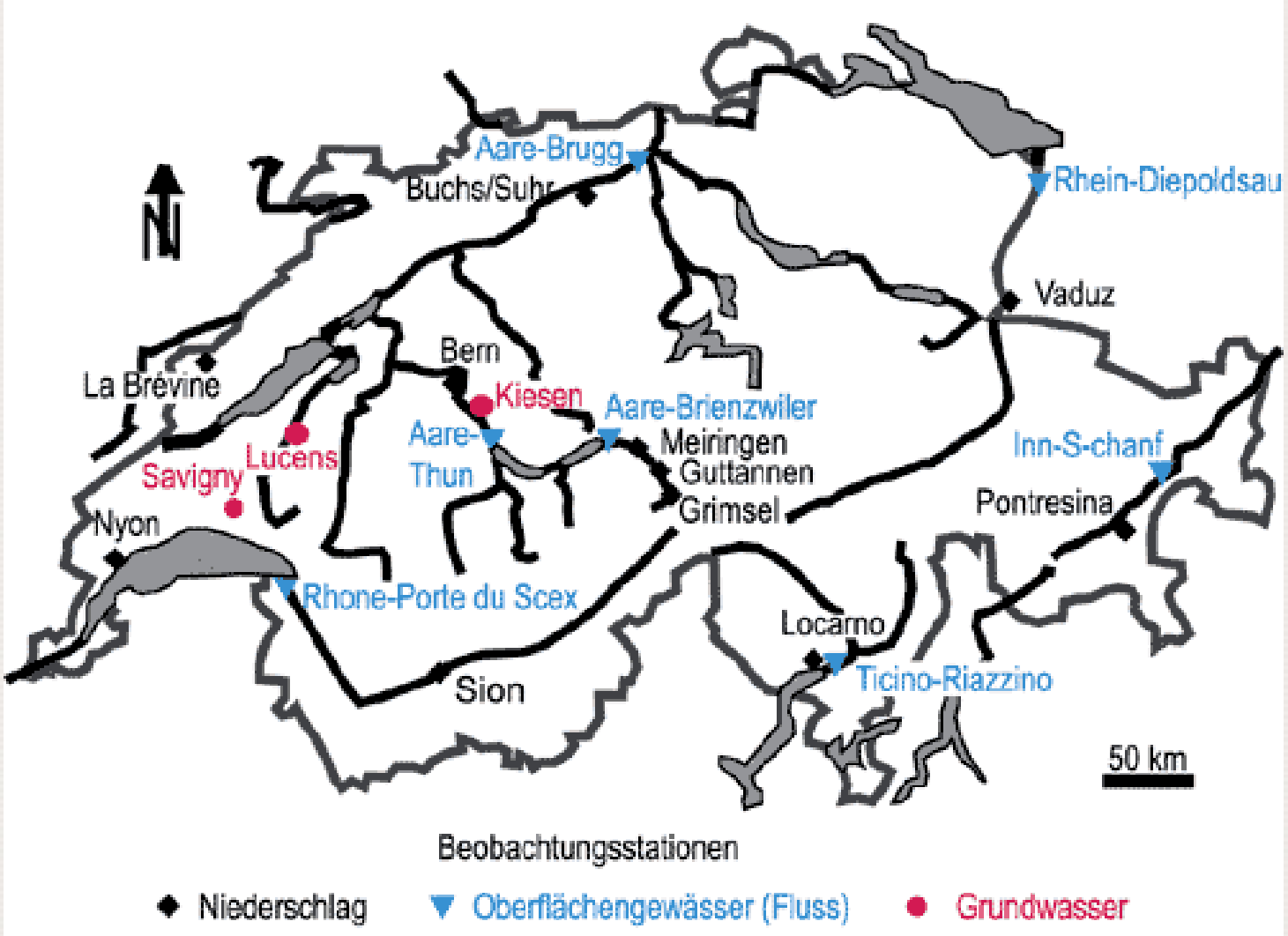
Isotopen-Meßnetz Schweiz



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Ref.: BUWAL

Schweiz – Publikation der Isotopenresultate

Aare – **Brienzwiler**

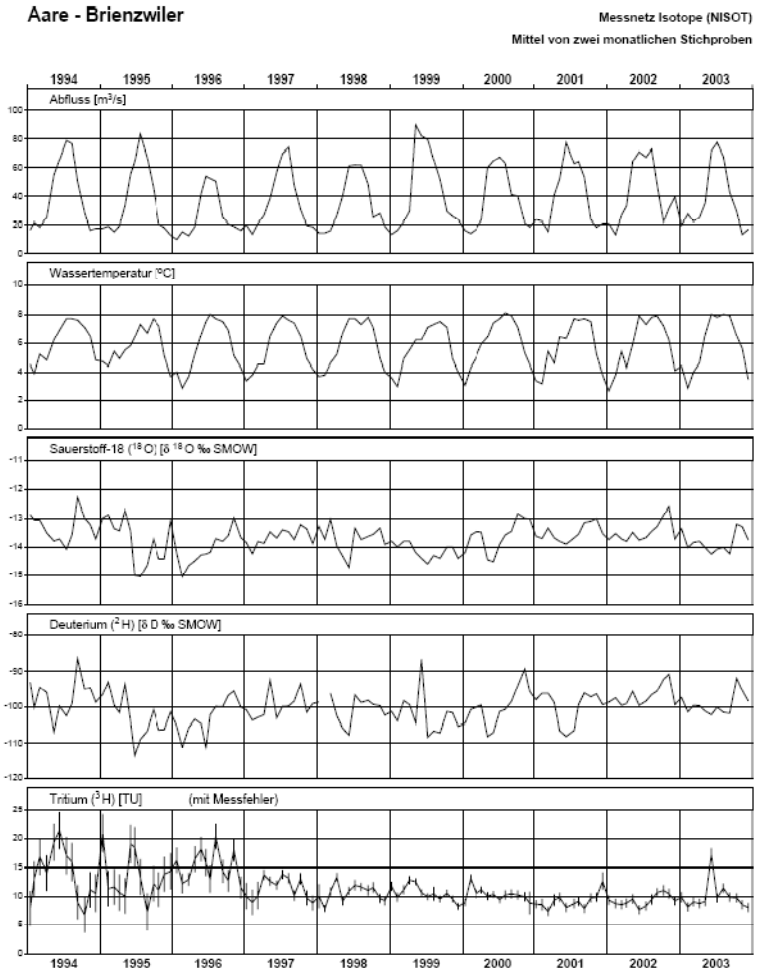
Koordinaten:	649.930 / 177.380
Stationshöhe:	570 m ü. M.
Grösse des Einzugsgebietes:	554 km²
Mittlere Gebietshöhe:	2150 m ü. M.
Vorhandene Daten: (Monatswerte, seit 03.07.1992)	**Deuterium**, **Sauerstoff-18**, **Tritium**, Abfluss, Temperatur

Lage der Station
Massstab1:50'000

© 2005 swisstopo (JD032367)

Messstelle
Brienzwiler

Kontaktadresse: Bundesamt für Wasser und Geologie – Sektion Hydrogeologie
Fax: +41-31-3247681 / Email: marc.schuerch@bwg.admin.ch
CH-3003 Bern-Ittigen

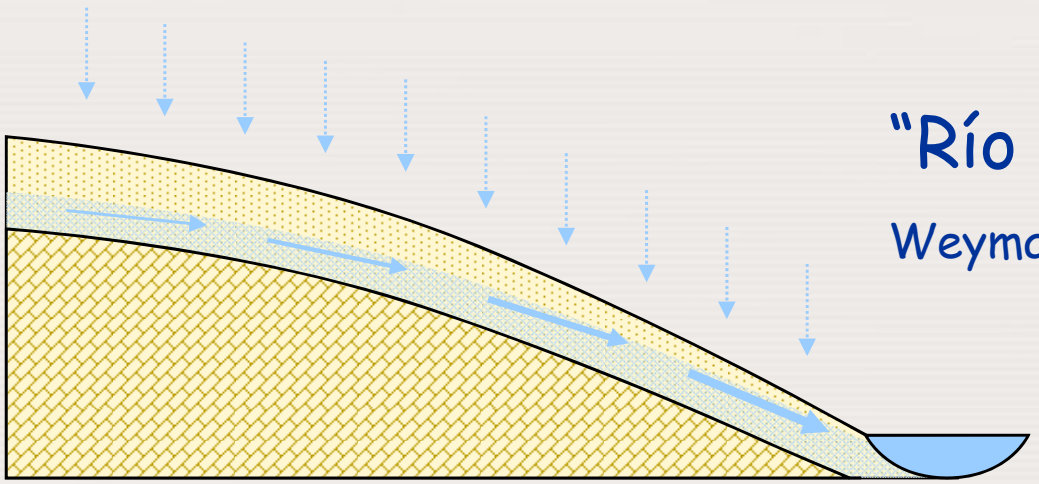


Ref.: www.bwg.admin.ch

Zusammenfassung

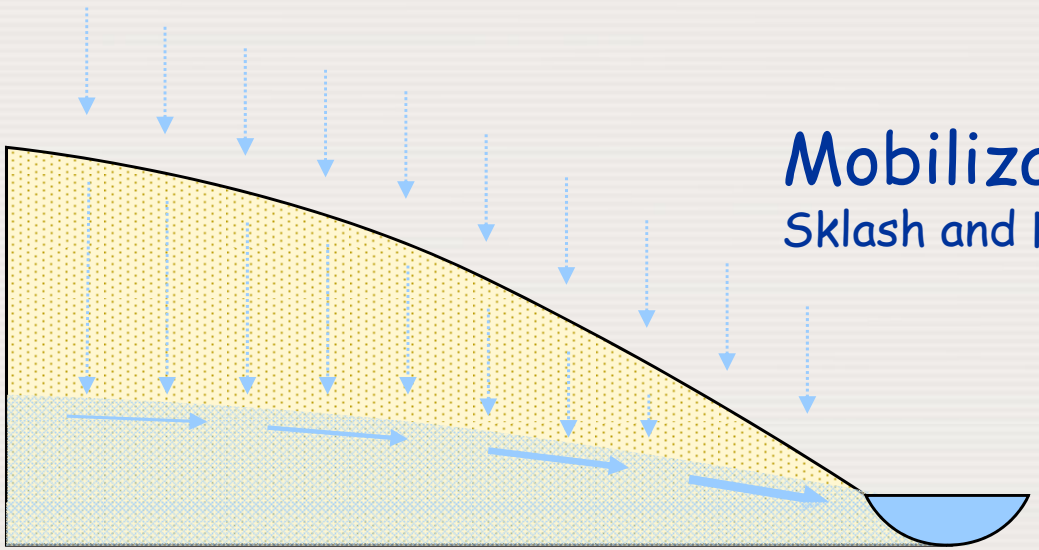
- Beproben von Niederschlag, Bach und einem Bohrloch (B1) als Minimalvariante
- Aufnahme von H-2

Conceptos del flujo subterraneo



"Río subterraneo"

Weyman, 1973, Harr 1977 and others



Mobilización del agua subterranea

Sklash and Farvolden, 1979