

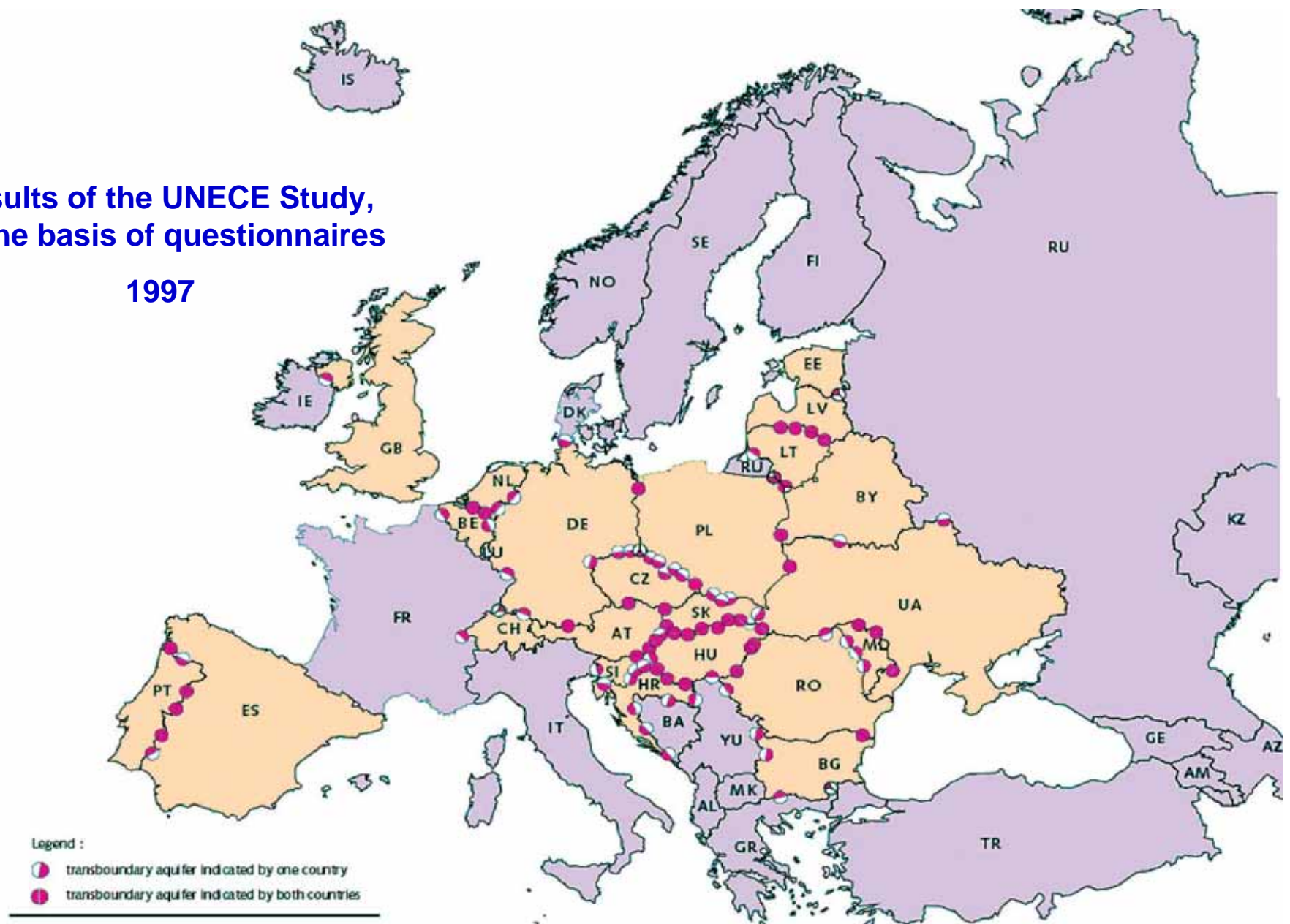
Transboundary Aquifers

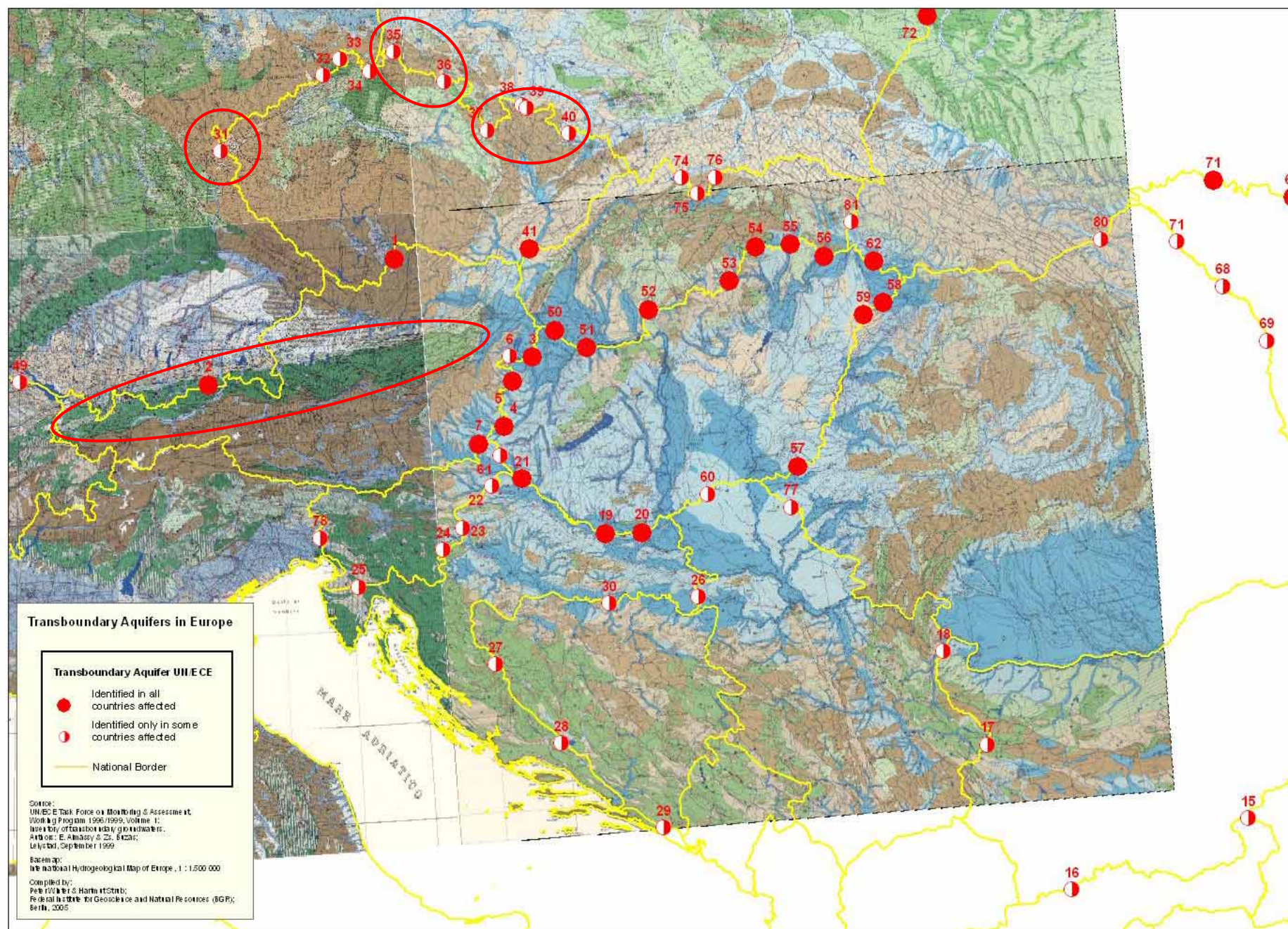
- Methodologies
- Results
- Problems of scale
- Future challenges

Willi Struckmeier
IAH President

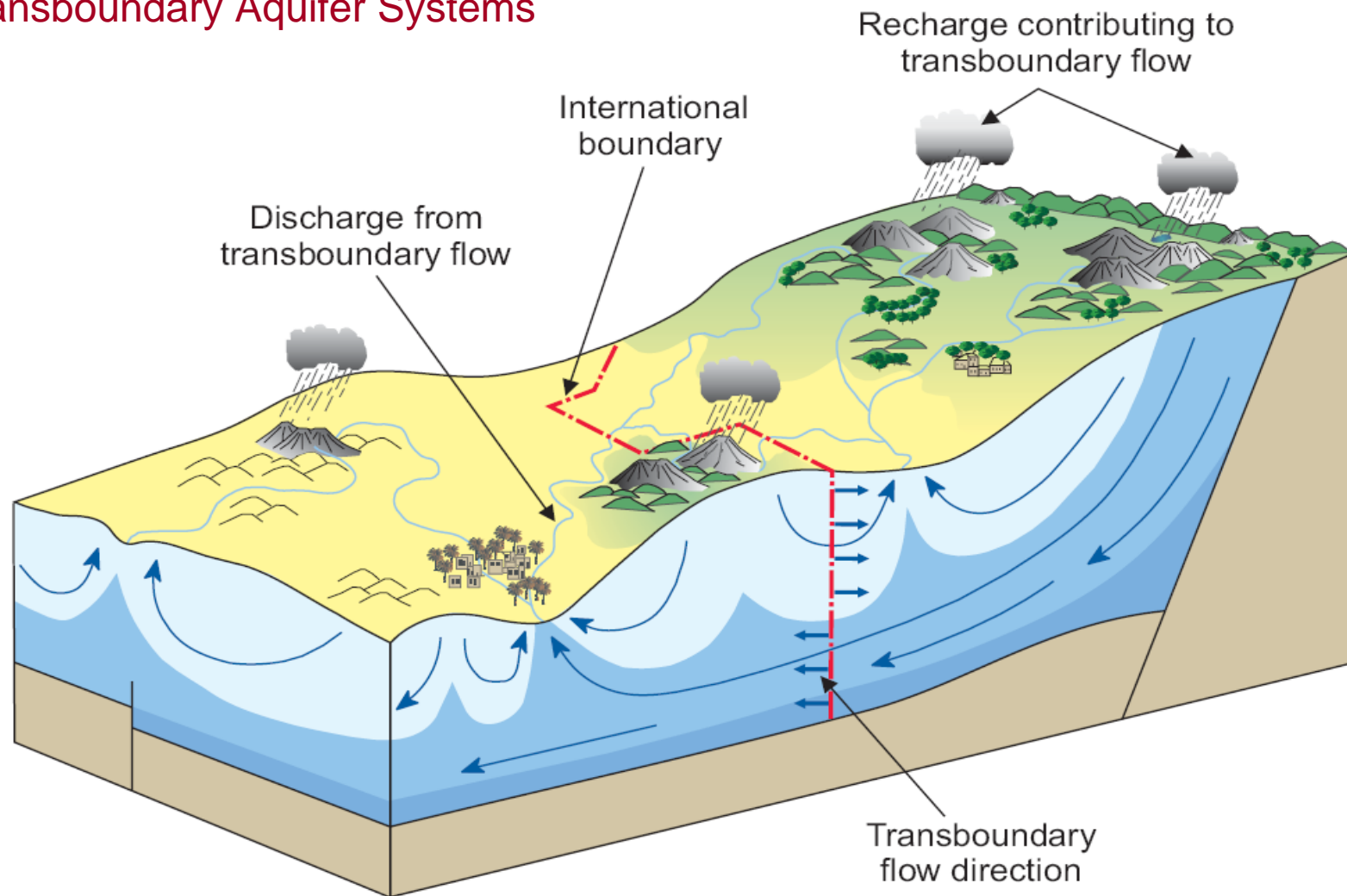
Results of the UNECE Study, on the basis of questionnaires

1997





Transboundary Aquifer Systems



Source: UNESCO / ISARM 2001

Hydrogeological Regions / Political Boundaries / River Basins



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Hydrogeology

- major groundwater basin with highly-productive aquifers
- area with complex structure including some important aquifers
- area with generally poor aquifers, locally overlain by river-bed aquifers

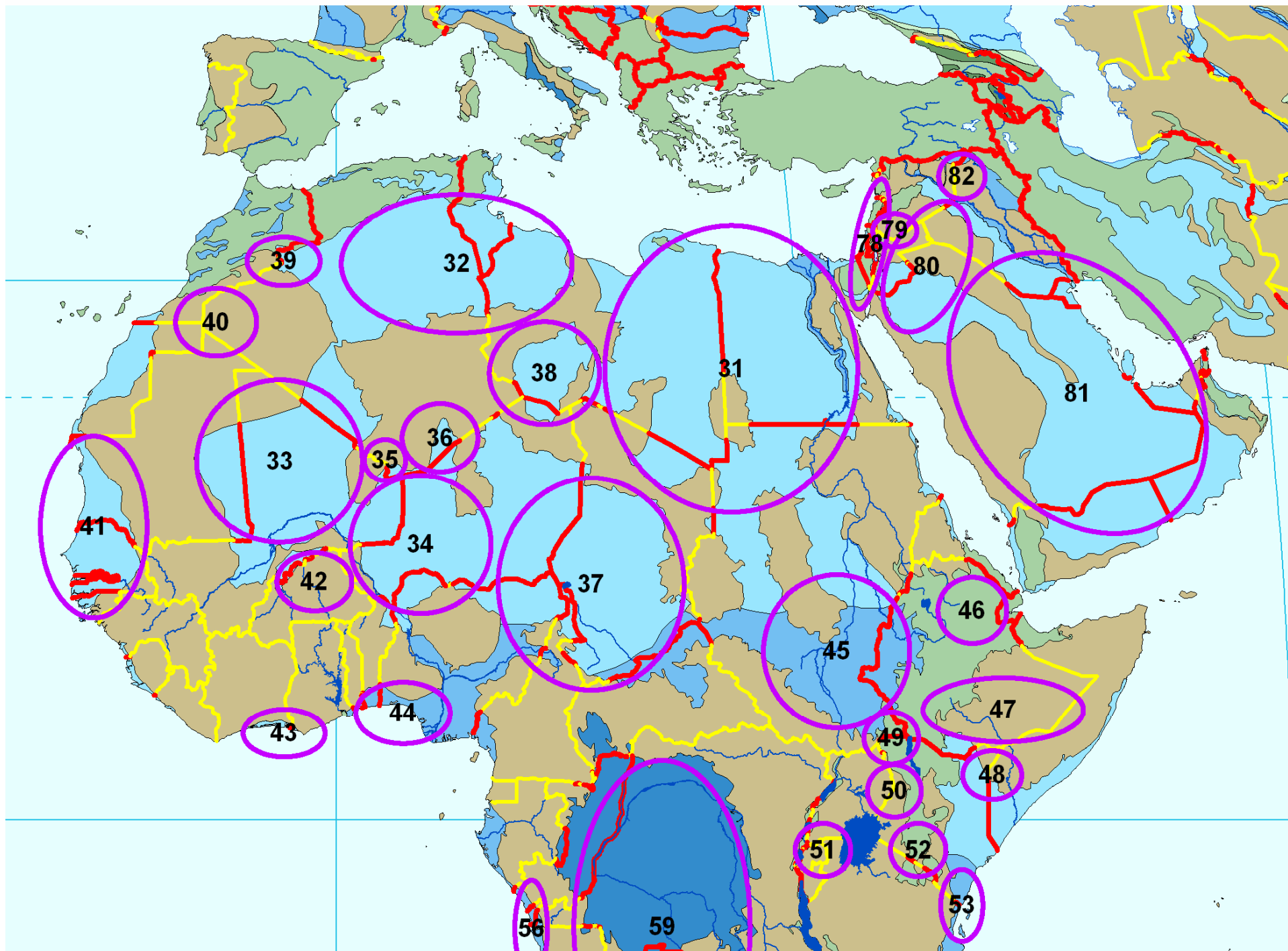
Surface Water

- polar ice
- large freshwater lake
- major river basin

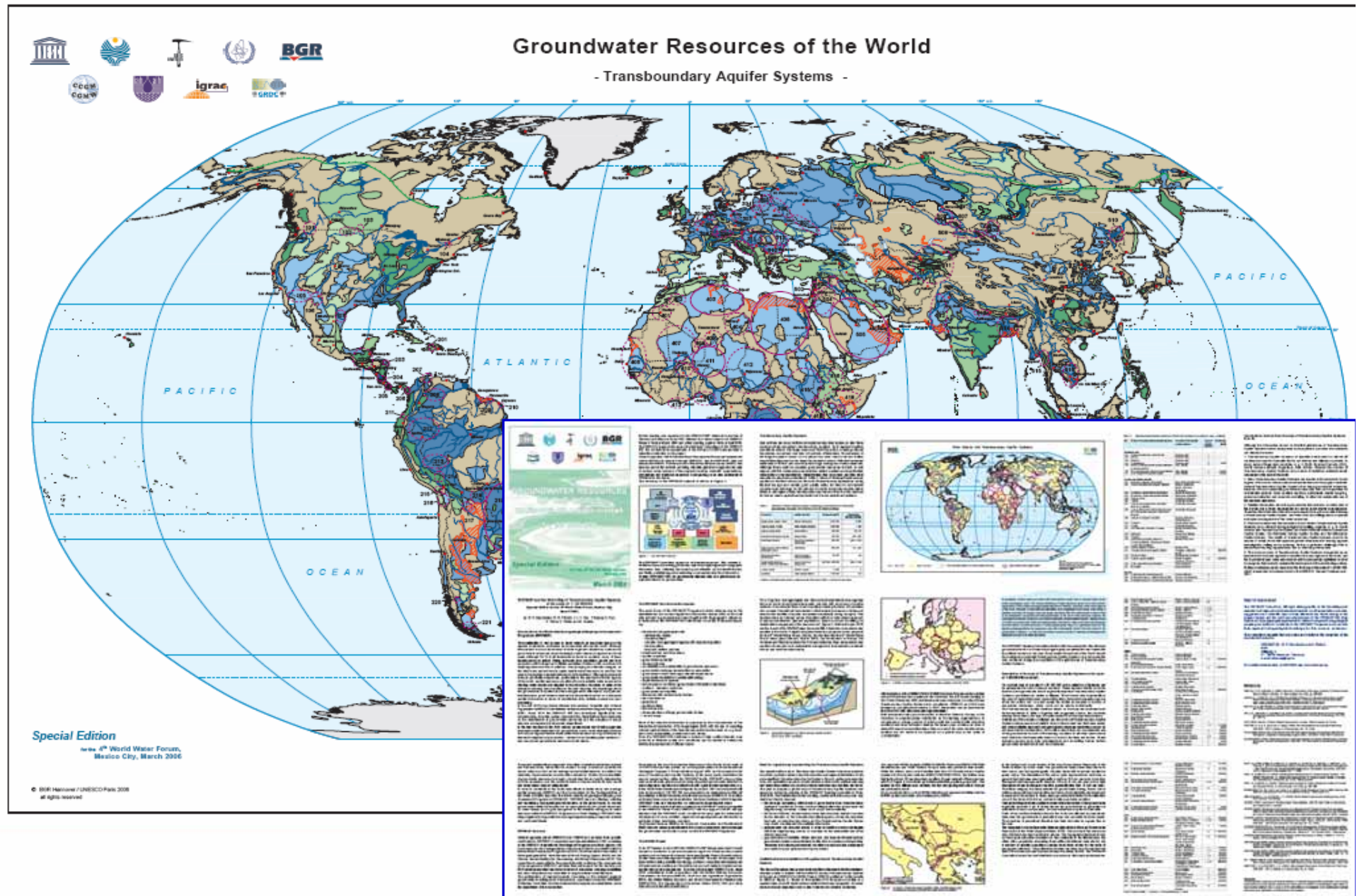
Other Geographic and Climate Features

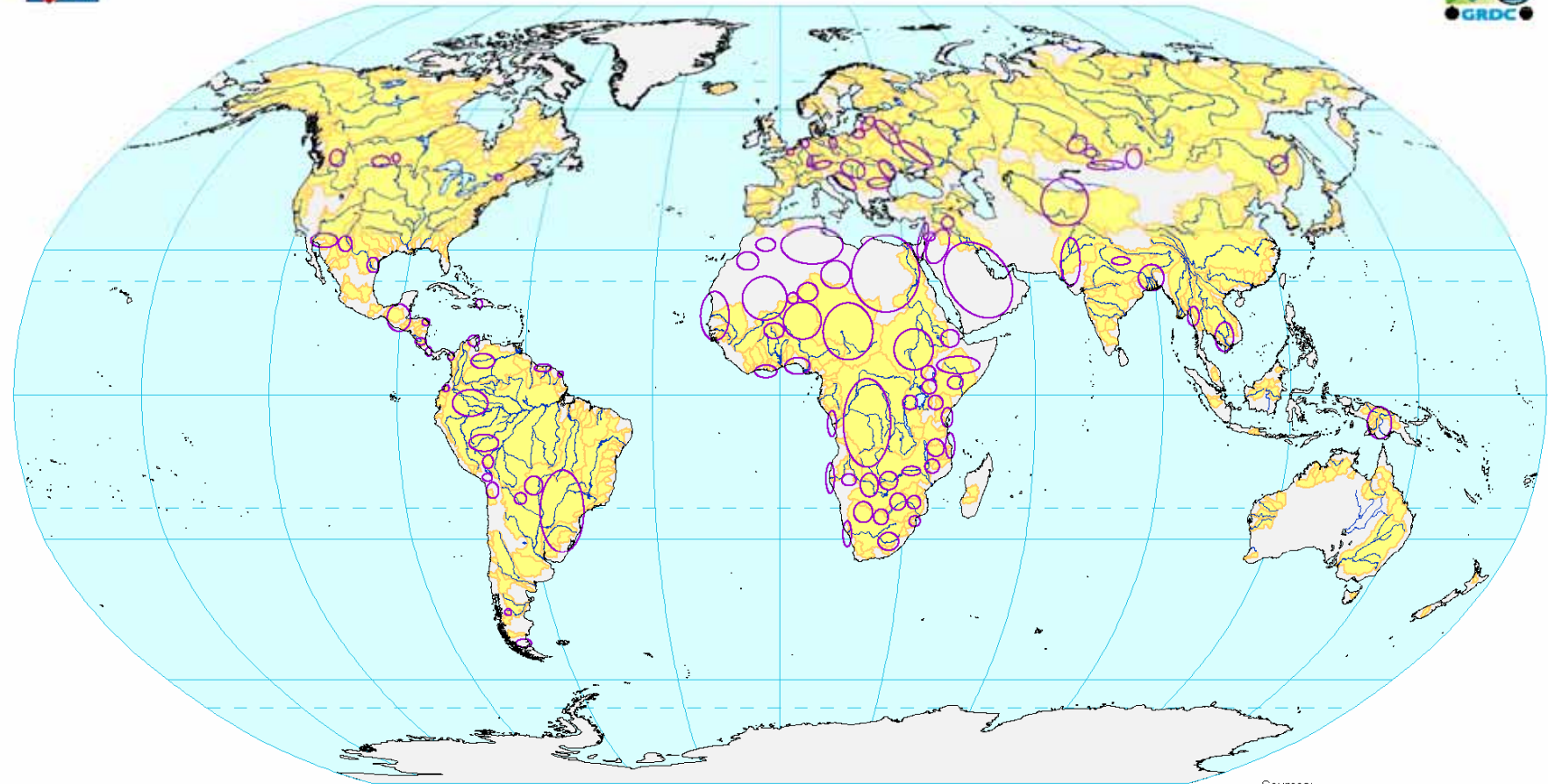
- political boundary

Hydrogeology version 1.1, extracted from WIRMAP
Topographic base map: COMANAL/IGBP (2000); Geological Map of the World 1:25,000,000, 2nd edition



Global Map of Transboundary Aquifer Systems





~ major river
 major river basin
 land area without active river basins (desert, inland ice)
 major transboundary aquifer system

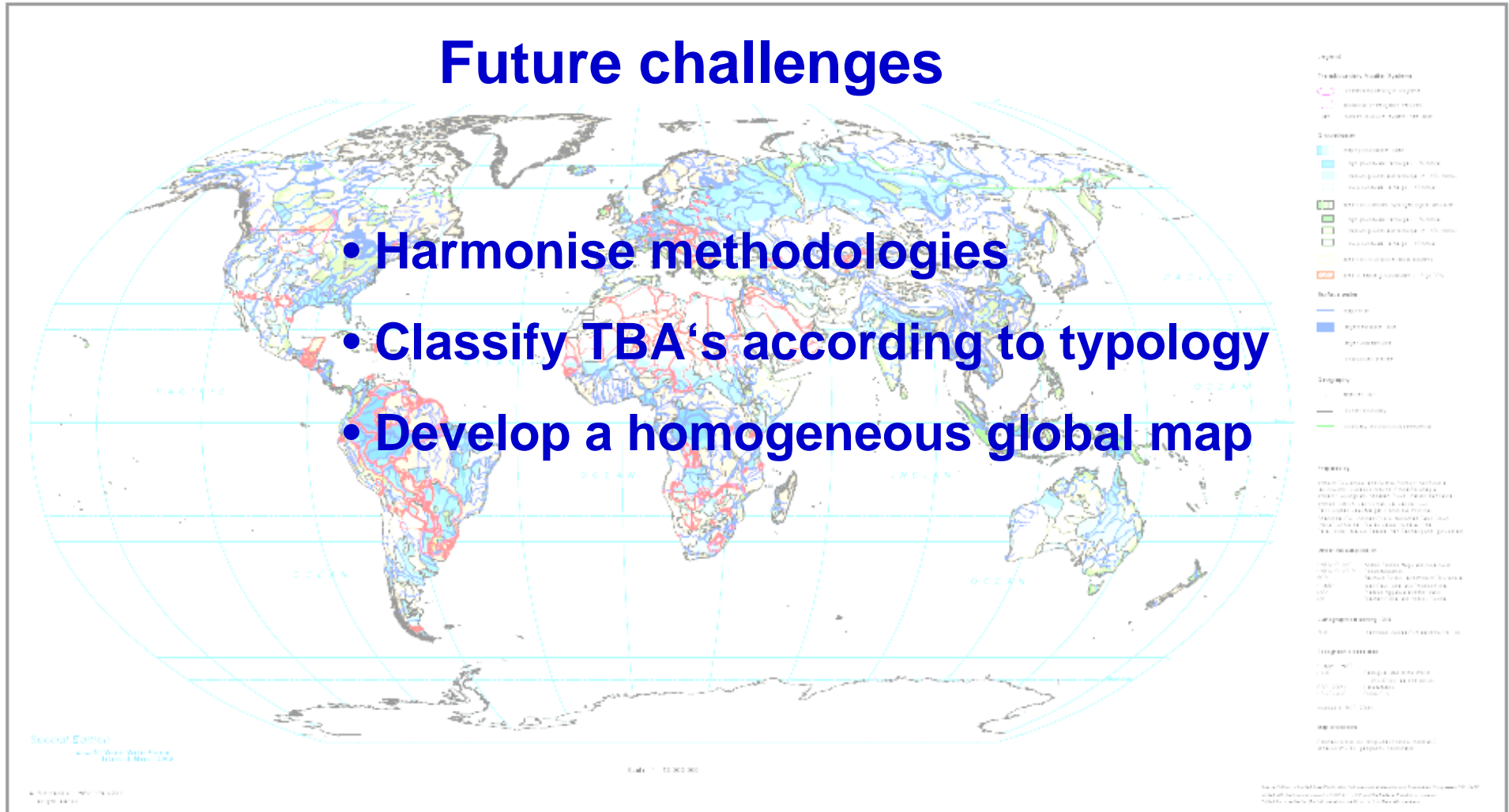
Sources:
 Basins selected, derived and adjusted by
 Global Runoff Data Centre (GRDC), Koblenz 2005,
 based on HYDRO1K by USGS
 & WHYMAP 2006

Transboundary Aquifers in South Eastern Europe (SEE)



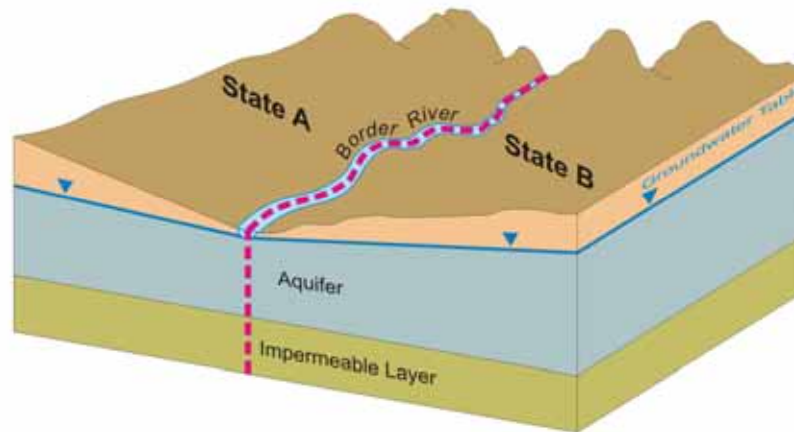
Future challenges

- Harmonise methodologies
- Classify TBA's according to typology
- Develop a homogeneous global map



- Phreatic aquifer
- GW connected to river
- Countries sharing the same aquifer

Figure 1: Riparian constellation: Type A

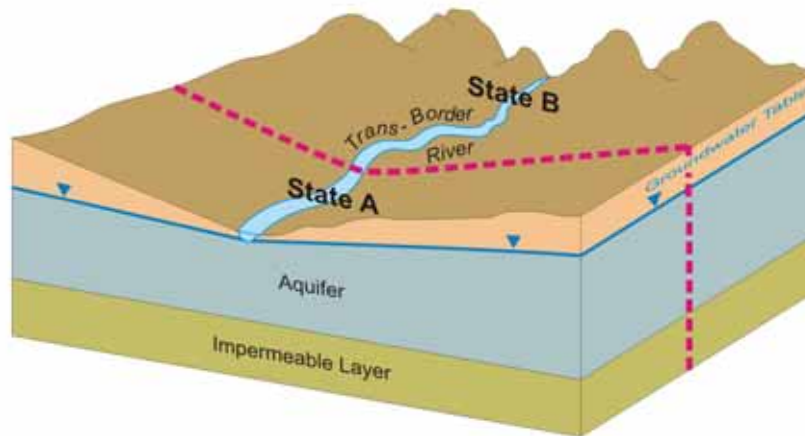


Transboundary Aquifer Constellations

after

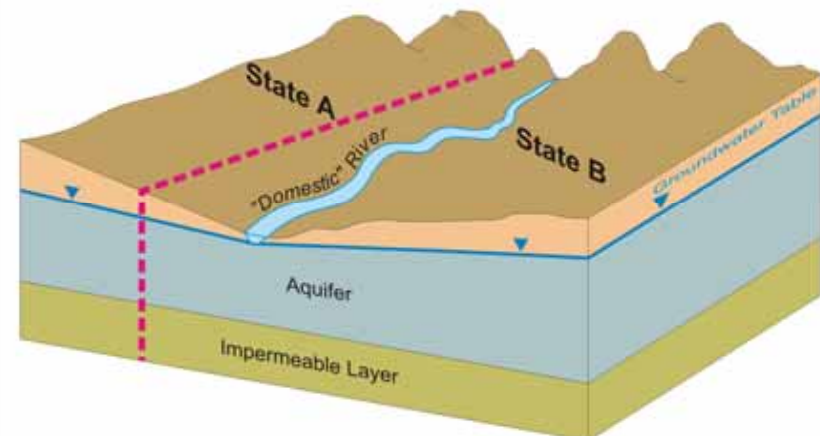
Eckstein & Eckstein 2005

Figure 2: Riparian constellation: Type B



Source: Eckstein / Eckstein (2005)

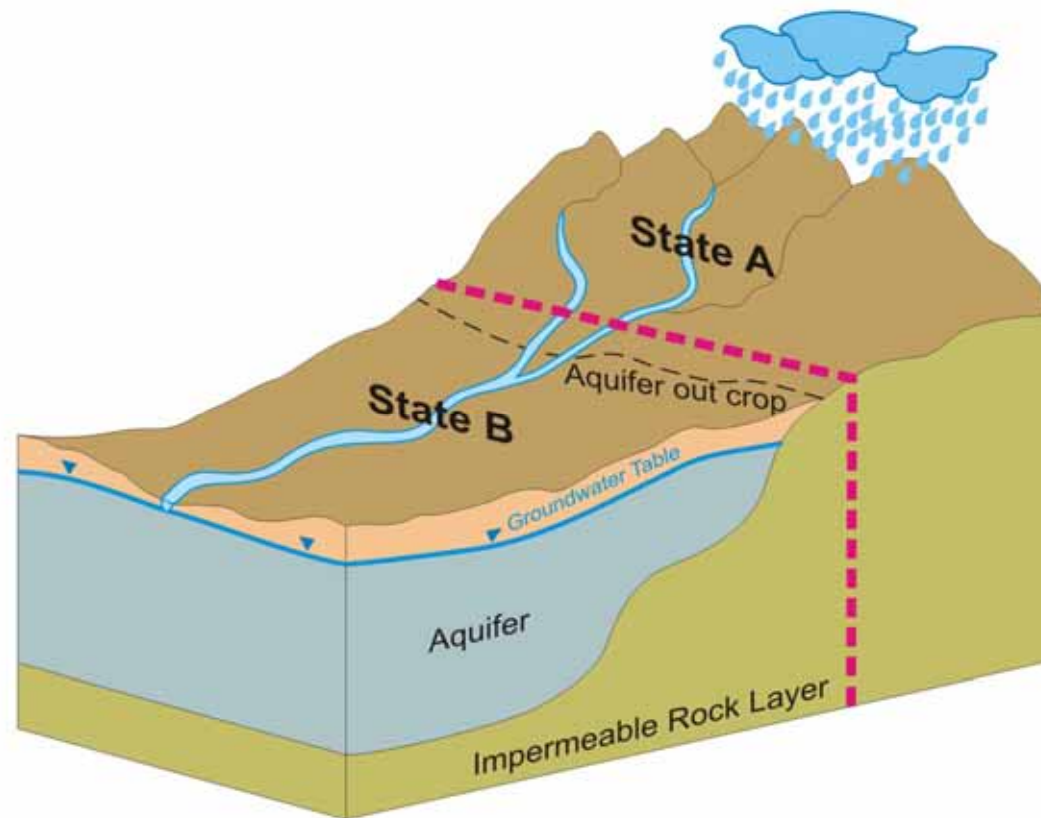
Figure 3: Riparian constellation: Type C



Source: Eckstein / Eckstein (2005)

- Phreatic (water table) aquifer
- River connected to GW in aquifer
- Inflow of river water from uphill state A across border
- State A outside aquifer, just connected by river

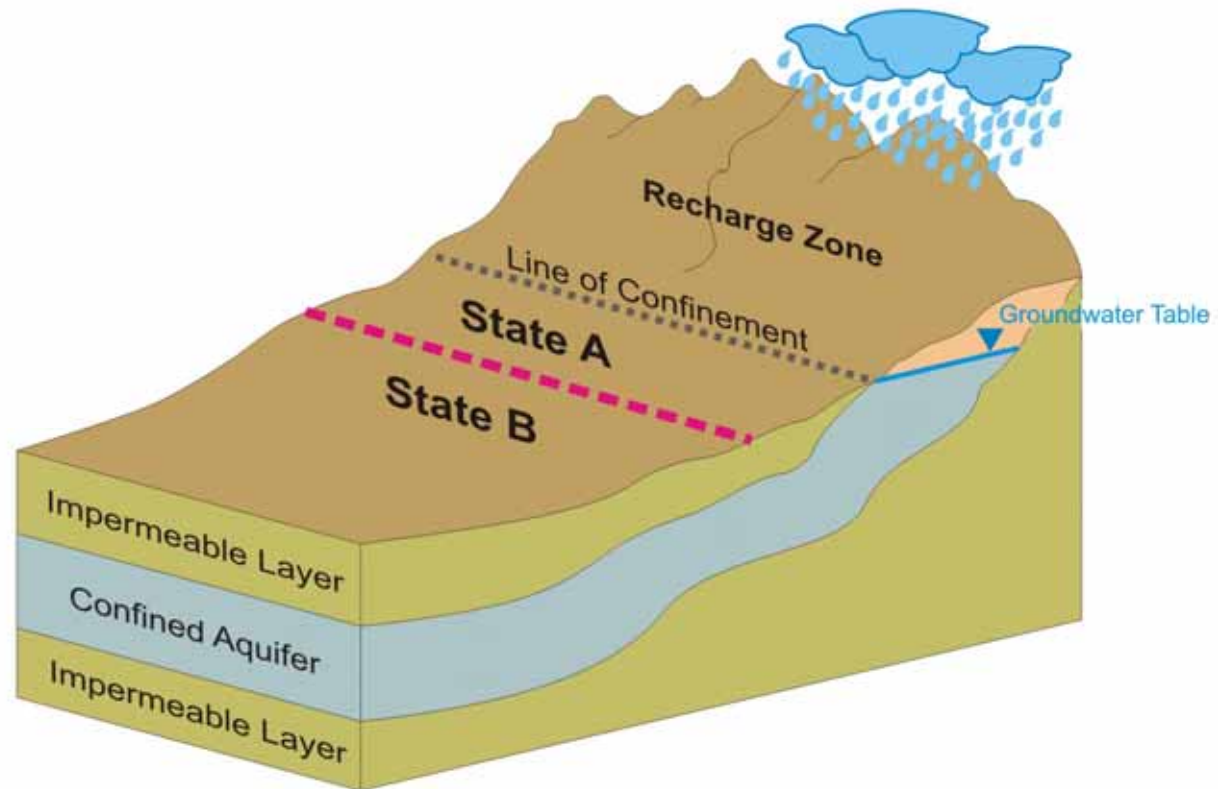
Figure 4: Riparian constellation: Type D



Source: Eckstein / Eckstein (2005)

- Confined, deep aquifer
 - No relation with surface water
 - Recharge (free water table) only in state A, but confined aquifer shared by states A and B
- = what, if state B heavily abstracts confined GW and lowers GW table?

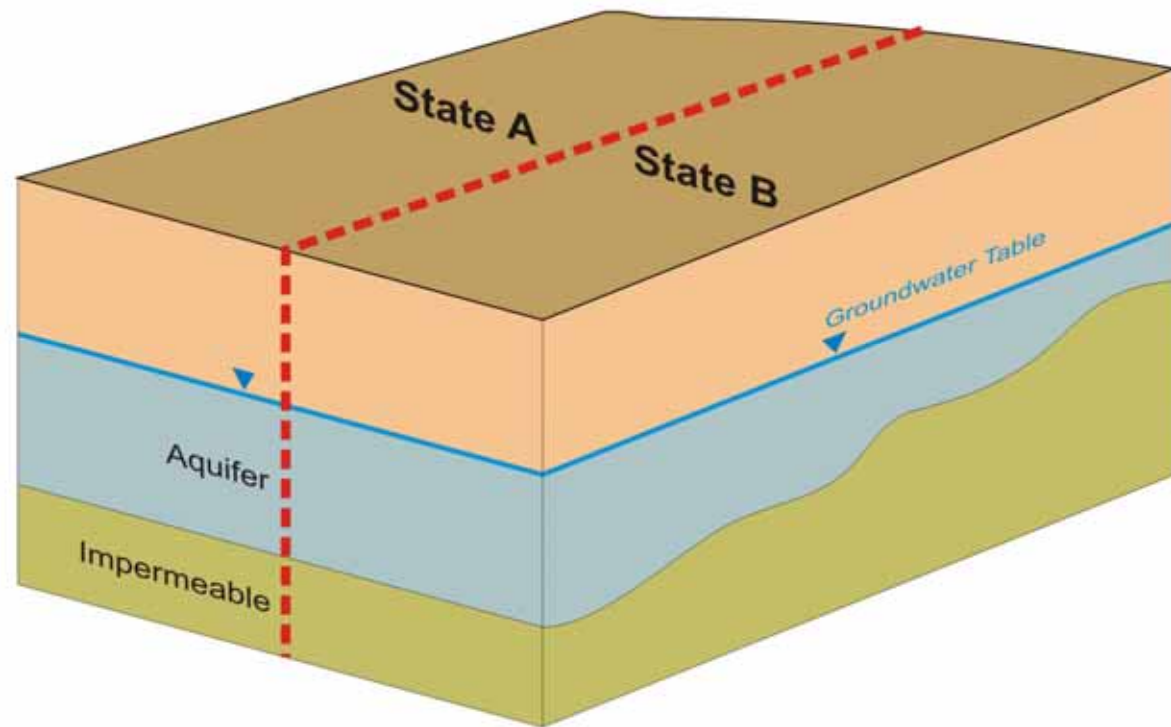
Figure 5: Riparian constellation: Type E



Source: Eckstein / Eckstein (2005)

- Usual setting for aquifers with non-renewable GW
- Deep water table
- Little or no gradient
- No surface water and no connection with GW

Figure 6: Riparian constellation: Type F



Source: Eckstein / Eckstein (2005)

Thank you