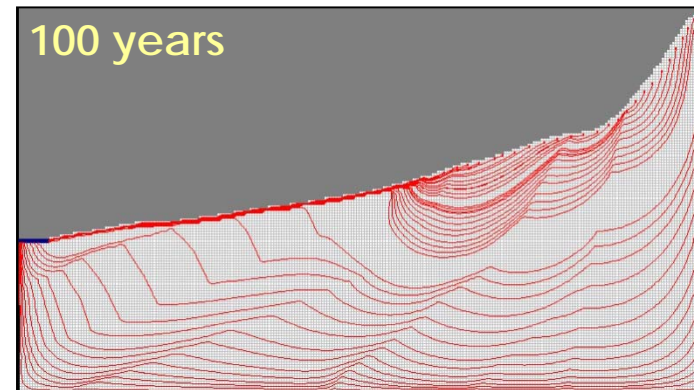
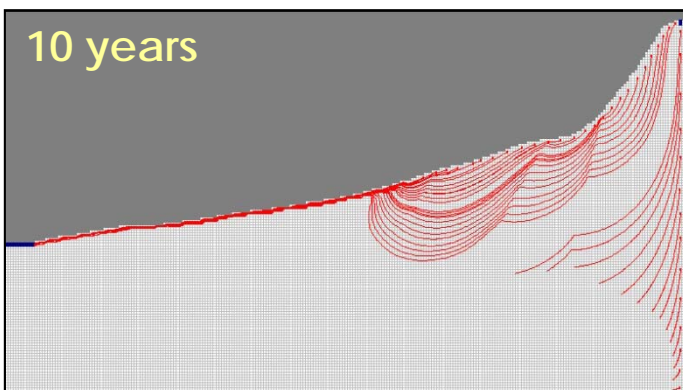
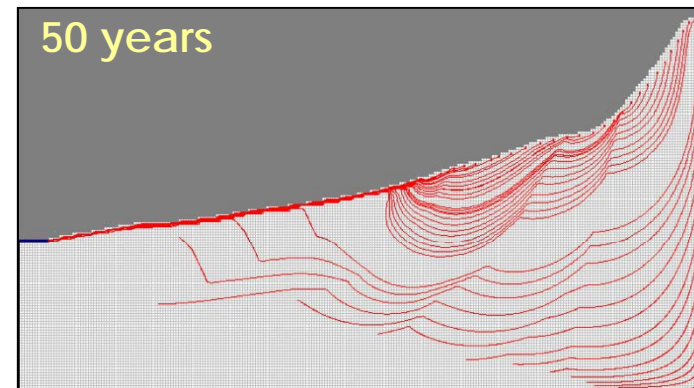
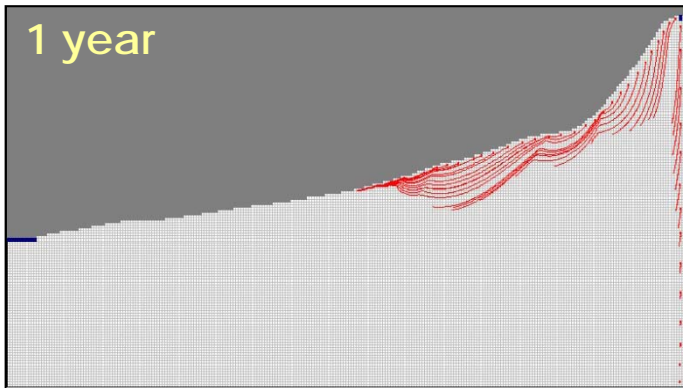
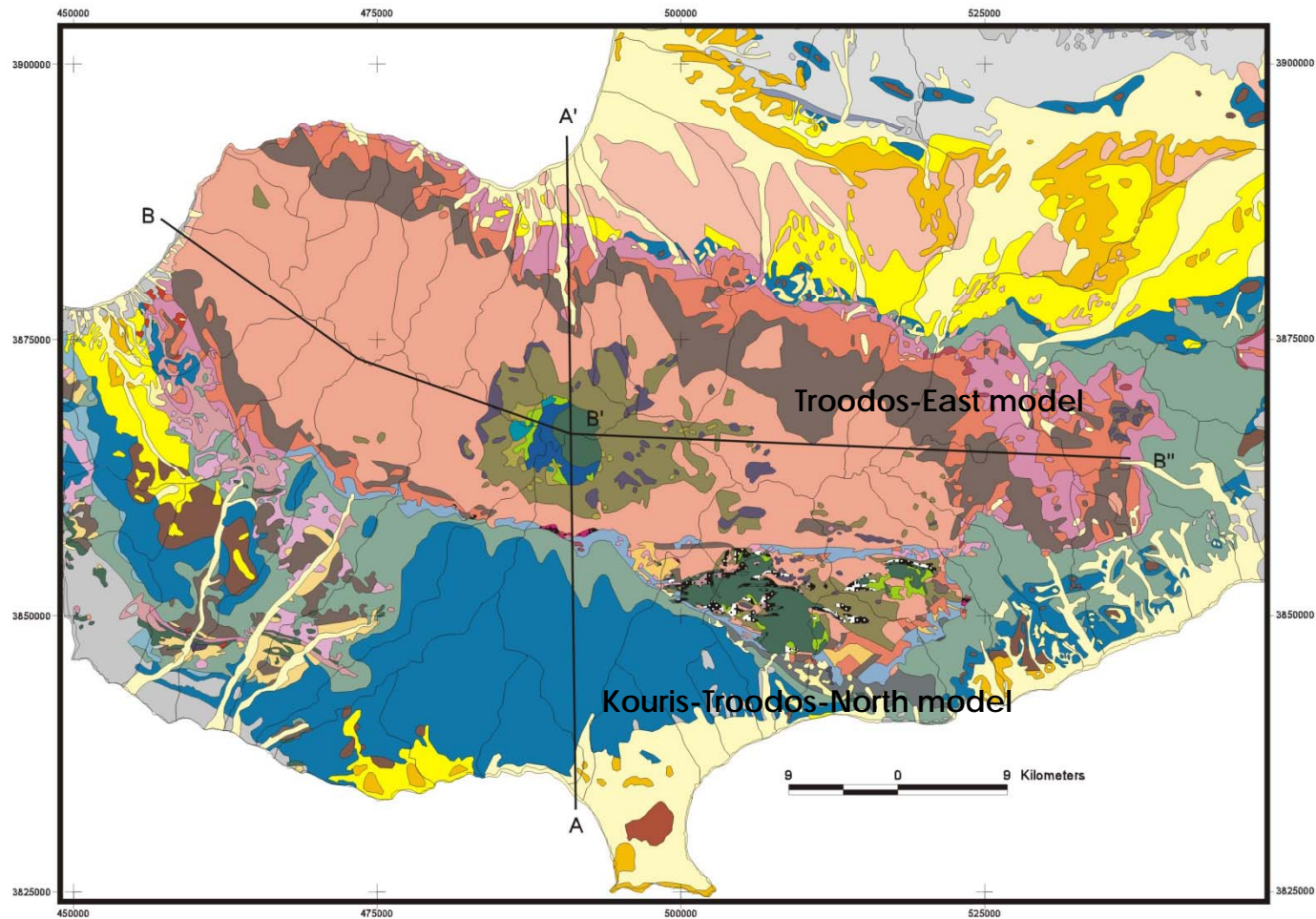


Wie fließt Grundwasser im Untergrund? Beispiel Zypern



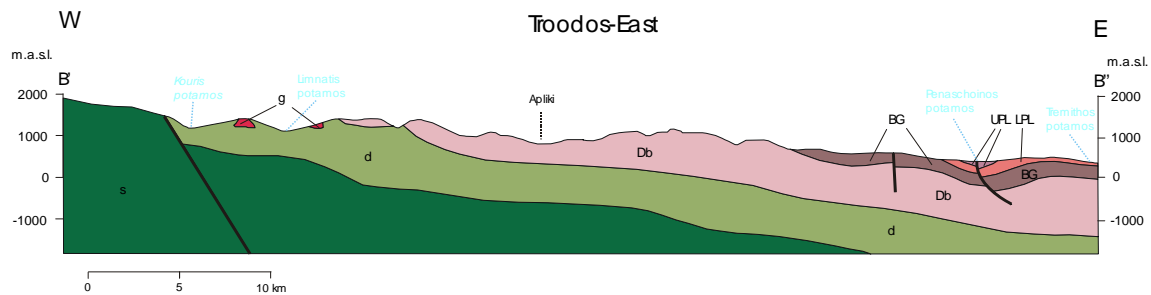
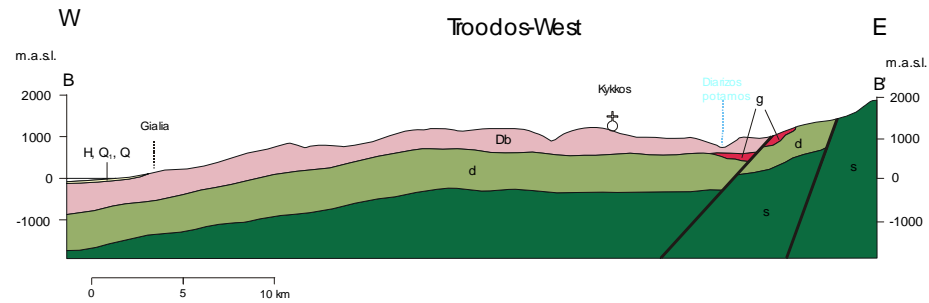
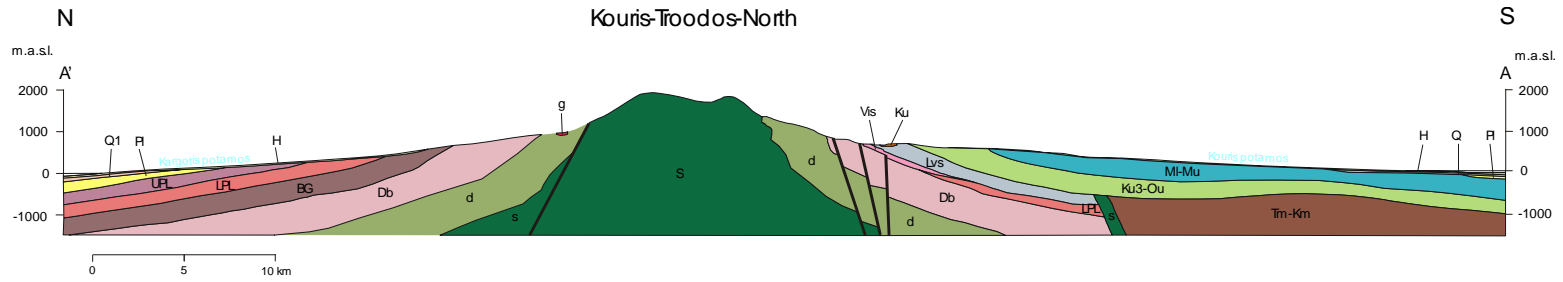
Re-evaluation of the **Groundwater Resources of Cyprus**
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Geologische Karte und Lage der Schnitte



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Schichtenbau und Stratigraphie



Re-evaluation of the **Groundwater Resources of Cyprus**
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Tiefenabhängigkeit von:

- **hydraulischer Leitfähigkeit**
- **effektiver Porosität**

Beide nehmen exponentiell ab, dies wird durch einen Tiefenfaktor berücksichtigt.

Table 1 Summary of measured and modelled conductivities and transmissivities for different lithologies and regions

Formation	Region	Models	Aquifer-thickness [m]		Hyd. Conductivity [m/s]		Transmissivity [m ² /s]		Mean conductivity [m/s]	Hyd.conductivity [m/s]
			min	max	min	max	min	max		modelled
UBR	Upper Troodos	All	20	50	5.89E-06	7.65E-05	2.06E-04	2.45E-03	4.40E-05	5.00E-08
Gabbro	Pitsilia, TroodosE	All	10	100	9.00E-07	1.20E-05	7.20E-05	1.20E-04	5.27E-07	1.20E-07
Diabase	TroodosN	Kouris-TroodosN	45	110	1.55E-07	3.00E-06	5.40E-05	3.00E-04	7.94E-07	5.00E-07
Diabase	Troodos E	Troodos E	20	175	1.14E-07	3.64E-06	1.14E-05	4.00E-04	6.90E-07	2.00E-07
Diabase	Troodos W	Troodos W	10	90	2.25E-07	2.00E-05	2.25E-05	8.00E-04	8.68E-07	2.00E-07
Basal Group	Troodos N	Kouris-Troodos N Troodos E	10	70	2.14E-07	1.25E-05	1.50E-05	1.25E-04	6.35E-06	8.00E-07
Basal Group	Troodos N, NE		30	120	1.77E-07	6.67E-06	2.13E-05	2.00E-04	3.42E-06	8.00E-06
Basal Group	Troodos E	Troodos W	10	90	2.25E-06	9.00E-05	1.80E-04	5.50E-03	2.03E-05	6.00E-06
Pillow Lavas		All	30	50	1.20E-06	1.50E-05	6.00E-05	3.00E-04	6.60E-06	7.00E-08
Transform Lavas and Breccia	Troodos S	Kouris-TroodosN	20	50	1.80E-06	1.20E-05	9.00E-05	3.00E-04	6.65E-06	6.50E-07
Lefkara-chalks	Troodos S	Kouris-Troodos N	35	150	3.00E-07	4.00E-05	3.00E-05	1.40E-03	9.15E-07	2.50E-07
Pakhna-chalks	NW Lemesos	Kouris-Troodos N	20	165	2.00E-07	9.50E-06	1.20E-05	4.75E-04	1.76E-06	3.50E-07
Gravel	Kouris_Episkopi	All	25	80	8.10E-07	1.32E-04	6.48E-05	5.28E-03	5.72E-05	7.00E-05
Gravel	TroodosN	All	25	30	3.74E-05	1.01E-04	9.35E-04	2.53E-03	8.90E-05	7.00E-05

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Table 1 Lithology and volumetric dimensions of the fractured aquifers

Catchment	Area [km ²]	Sat. aquifer thickness [km]	Dewaterable Aquifervolume V_d [km ³]
Upper Xeros	67.57	0.05	3.38
Upper Kargotis	16.80	0.05	0.84

Table 2 Recession parameters and resulting porosities

Catchment	Aquifer-lithology	High baseflow discharge Q_0 [m ³ /s]	Recession constant k [days/log cycle volume change]	Desiccation constant a [1/s]	Water storage volume Q_d [km ³]	Effective Porosity P_{eff} [%]
Upper Xeros	Diabase	0.4	120	0.0192	1.80 E-03	0.05
Upper Kargotis (primary porosity)	Ultramafic Sequence	0.6	115	0.0200	2.59E-03	0.31
Upper Kargotis (secondary porosity)	Ultramafic Sequence	0.2	450	0.0051	3.38E-03	0.40

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Formation	Effective porosity [%]
Alluvium	12
Fanglomerates	10
Apalos-Kakkaristra-Athalassa	2
Nicosia	1
Pakhna	0.1
Lefkara	0.1
Upper Pillow Lavas	0.01
Lower Pillow Lavas	0.01
Basal Group	0.08
Diabase	0.05
Plagiogranite	0.05
Gabbro	0.08
Mantle Sequence	0.35
Agios Photios	0.1

Beachten Sie die geringe effektive Porosität! Das ist typisch für Festgestein und ganz wichtig für das Hydrologische Verhalten:

- starker Anstieg der GWS*
- viele Quellen*

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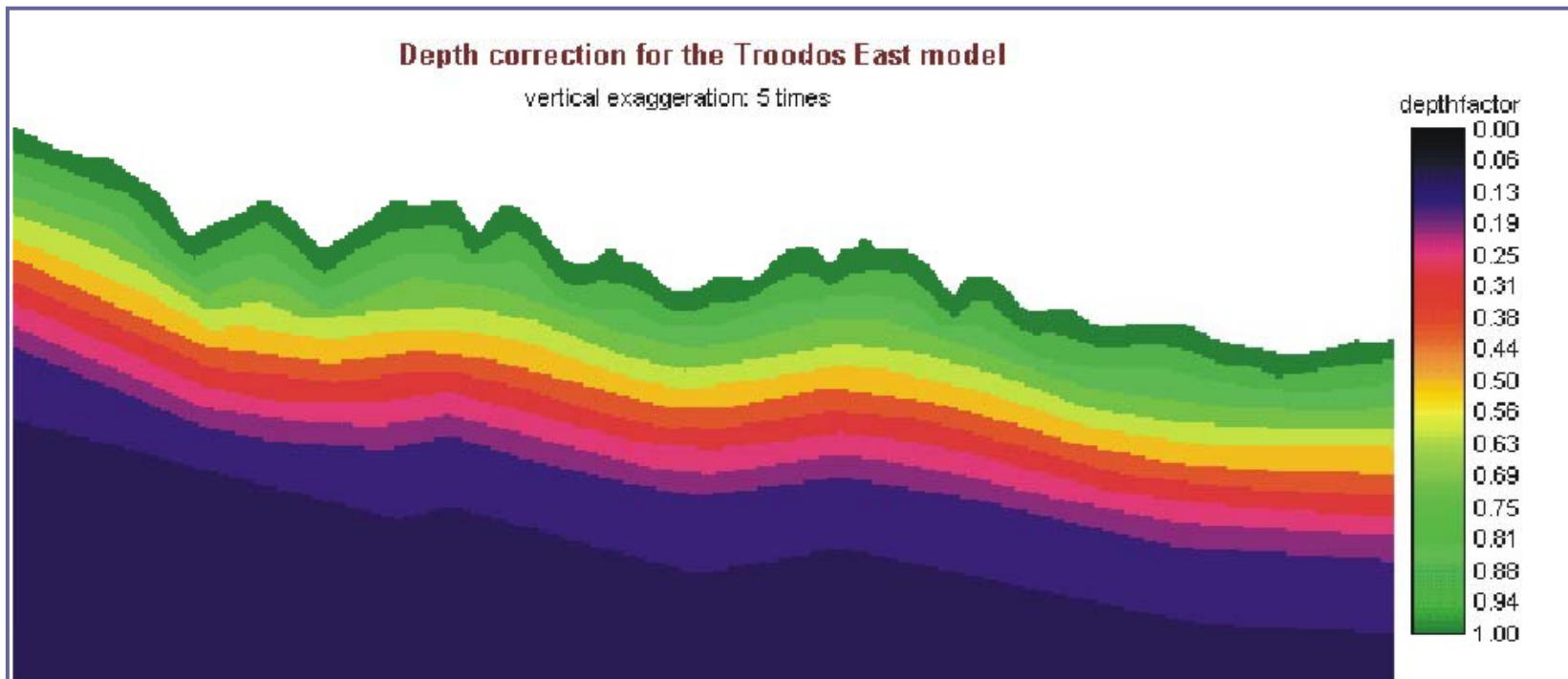
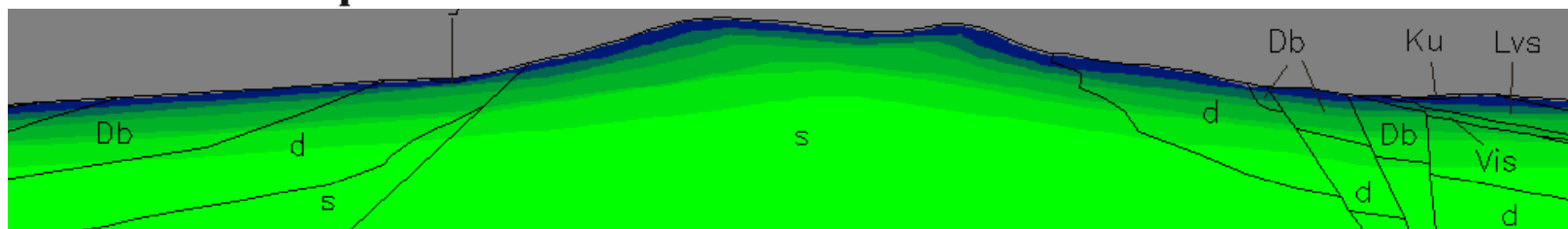


Fig. 1 **Illustration of the depthfactor steps used to correct hydraulic conductivities and porosities of the Troodos East cross section model**



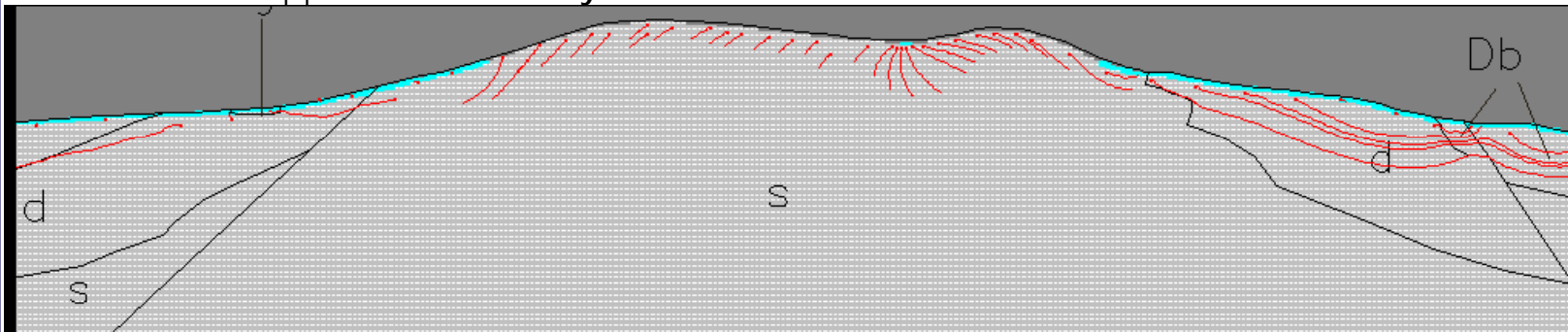
Depth factor for the Kouris-Troodos-North model: exponential decrease from 1 (blue) to light green (0.1)

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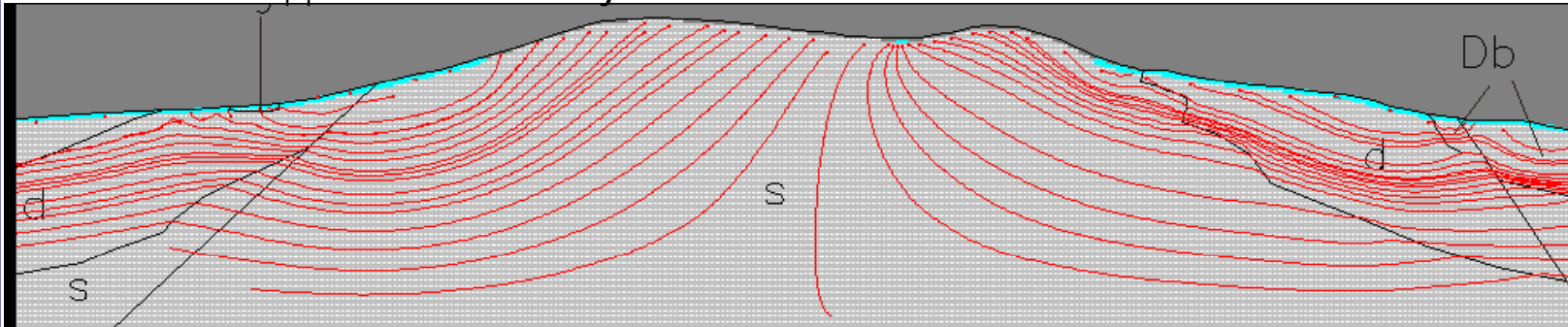
Groundwater models – Troodos Concept Model

Pathlines of the three models for different time periods

Pathlines for the Upper Troodos for **10 years**



Pathlines for the Upper Troodos for **200 years**

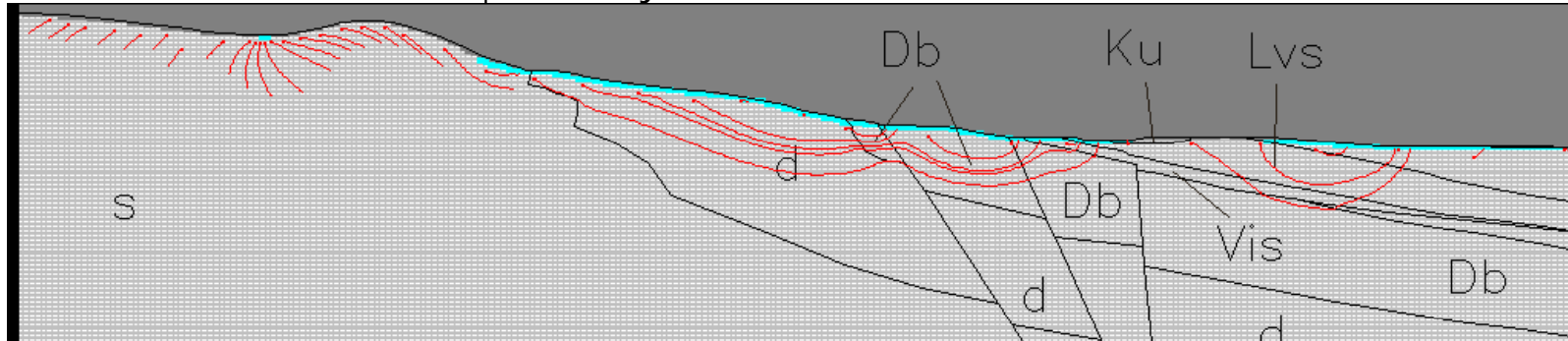


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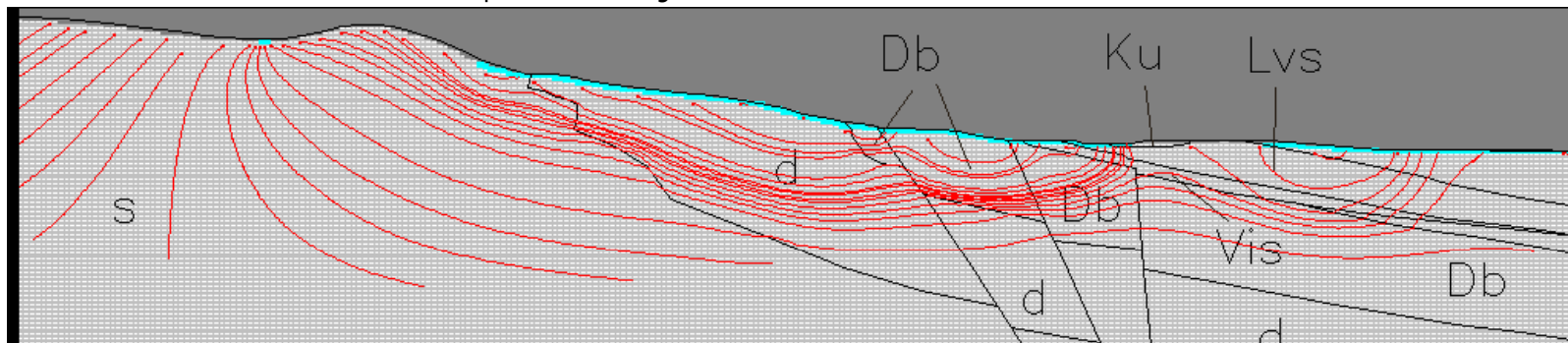
Groundwater models – Troodos Concept Model

Pathlines of the three models for different time periods

Pathlines for the Troodos-Arakapas for **10 years**



Pathlines for the Troodos-Arakapas for **200 years**

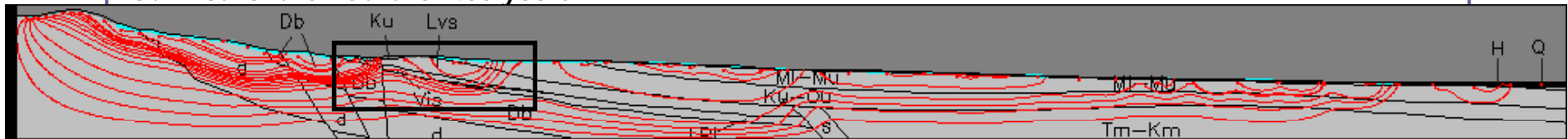


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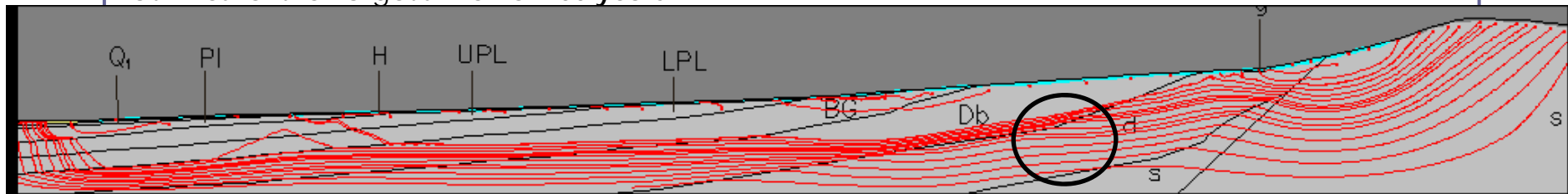
Groundwater models – Troodos Concept Model

Pathlines of the three models for different time periods

Pathlines for the Kouris for **400 years**



Pathlines for the Kargotis river for **200 years**



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- **Man erkennt an den Fließbahnen die ‘Recharge’ Gebiete und die ‘Discharge’ Gebiete**
- **Hang-paralleles Fließen ist die Ausnahme**
- **Die hydraulische Leitfähigkeit nimmt mit der Tiefe (meist) exponentiell ab: daher fließt Wasser tendenziell sehr viel stärker nahe der Erdoberfläche**