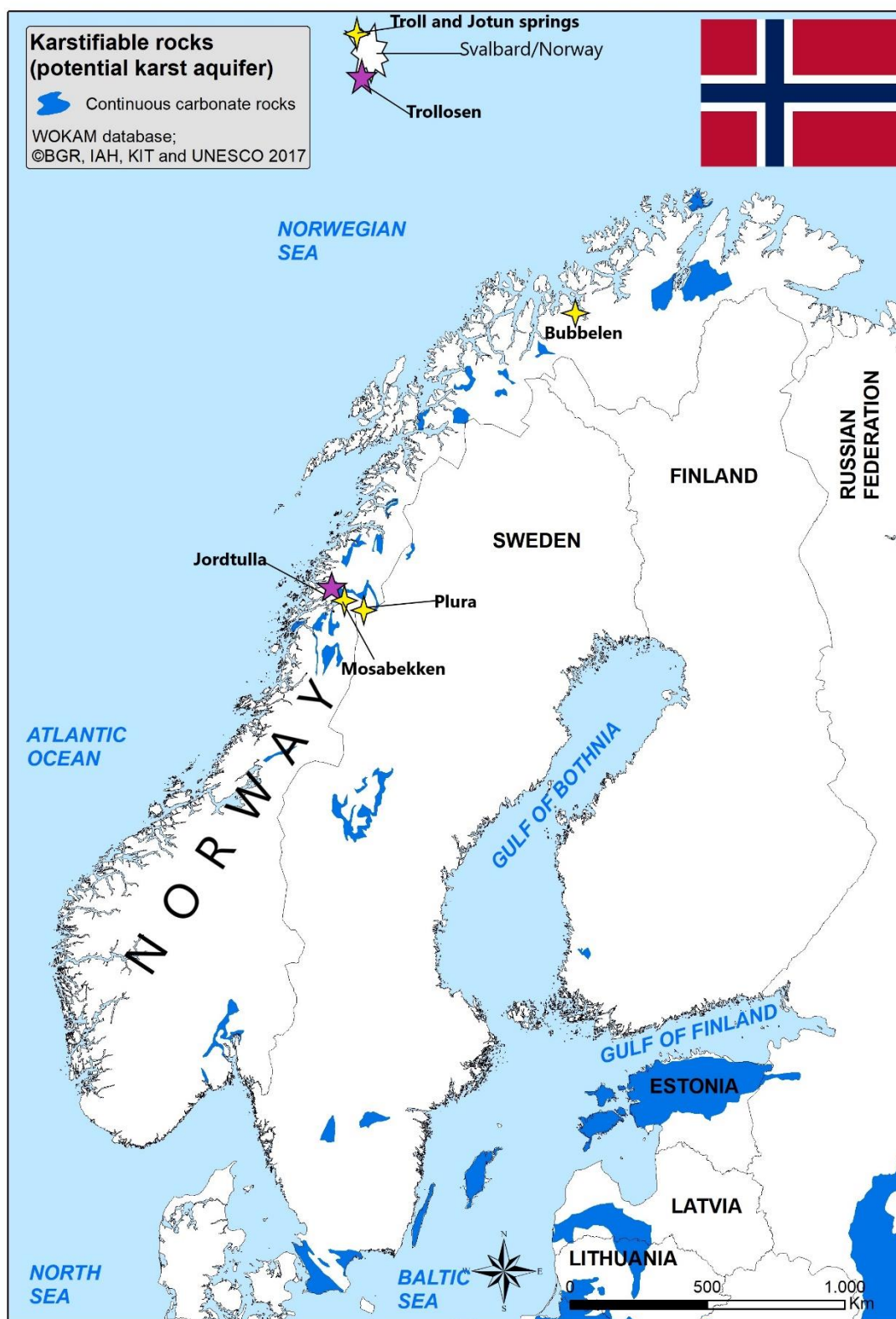


**Karstifiable rocks
(potential karst aquifer)**

 Continuous carbonate rocks

WOKAM database;
©BGR, IAH, KIT and UNESCO 2017

 Troll and Jotun springs
Svalbard/Norway
 Trollosen



Country (NIKAS)	NIKAS springs	Coordinates / Nearby City	Spring discharge (Q in l/s,min/av/max) / tapped or not	Criteria* order / Main justification */ H-historic, A-aesthetic, S-scientific, E-Economic, Ec-ecologic	Data collected by
Norway 	1. Bubbelen	N69°59'38.26 E22°20'50.5" Z = 133 m asl Alta, North Norway, Bognelva basin	- / - / > 100 (High discharge during snowmelt) Not tapped	A, S, H <i>The spring is issuing from dolomite marbles of Scandianvian Caledonides (Neoarchaeon to early Paleoproterozoic age). One of very few artesian spring mounds in Norway. A nearby river is pirated from higher terrain. During high flow (snowmelt) the pressure head rises well above the terrain surface around the spring, making a pronounced "fountain mound" at the outlet. Tourist attraction since beginning of XX Ct.</i>	Stein-Eril Lauritzen, Rannveig Øvrevik Skoglund
	2. Møsabekken spring	N66°22'44.4" E14°3'38.10" Z = 54 m asl Rana, North Norway, Mo i Rana, Ranelva basin	>1/40/>100 Spring water (T: 4°C; EC: 113-277 µS/cm) is utilized for livestock supply	S <i>This spring is draining the calcite marbles of Hammarneset karst area (Scandianvian Caledonides). In the catchment is the preserved cave Hammarnesgrotta. The cave was developed more than half a million year ago, in a different topographic location and landscape. The cave has suffered from minor modification during the subsequent glaciations.</i>	Stein-Eril Lauritzen, Rannveig Øvrevik Skoglund
	3. Plura spring	N66°16'49.2" E14°43'45.1" Z = 396 m asl Rana, North Norway, Mo i Rana, Ranelva basin	- / - / - Unnaturally low flow due to impact of hydropower dam Not tapped	S, E <i>Plura spring is the resurgence of the Plura river. The spring is issuing from the calcite marbles of Hammarneset karst area (Scandianvian Caledonides). The river flows through a 3.8 km long cave system and reaches a depth of 132 m. In 1968 a hydropower dam was built upstream in Lake Kalvatnet reducing the discharge through the system, which made it possible to dive the phreatic cave system. Two large collapse dolines are situated above the cave system. Due to low flow it is used for commercial cave diving.</i>	Rannveig Øvrevik Skoglund, Stein-Eril Lauritzen
	4. Troll and Jotun springs	N79°27'21.696" E13°16'42.959" Z ~ > 1 m asl Svalbard, Norway, Northern Spitsbergen, Ny-Ålesund	- / 10 / - Not tapped	S, A <i>Possibly the northernmost documented hot springs on land. Thermal water with temperature around 25°C. It is connected to Generalfjellet marble formation belonging to the Proterozoic basement. Located along a major N-S trending fault-zone, and close to the Sverrefjell volcano, active in the late Pleistocene. There are travertine deposits, terraces and pools. Water of meteoric origin, glacial meltwater that takes a sub-permafrost flow route, temperature probably increase due to a high geothermal gradient related to Quaternary volcanism in the area.</i>	Stein-Eril Lauritzen, Rannveig Øvrevik Skoglund

NIKAS – Bubbelen



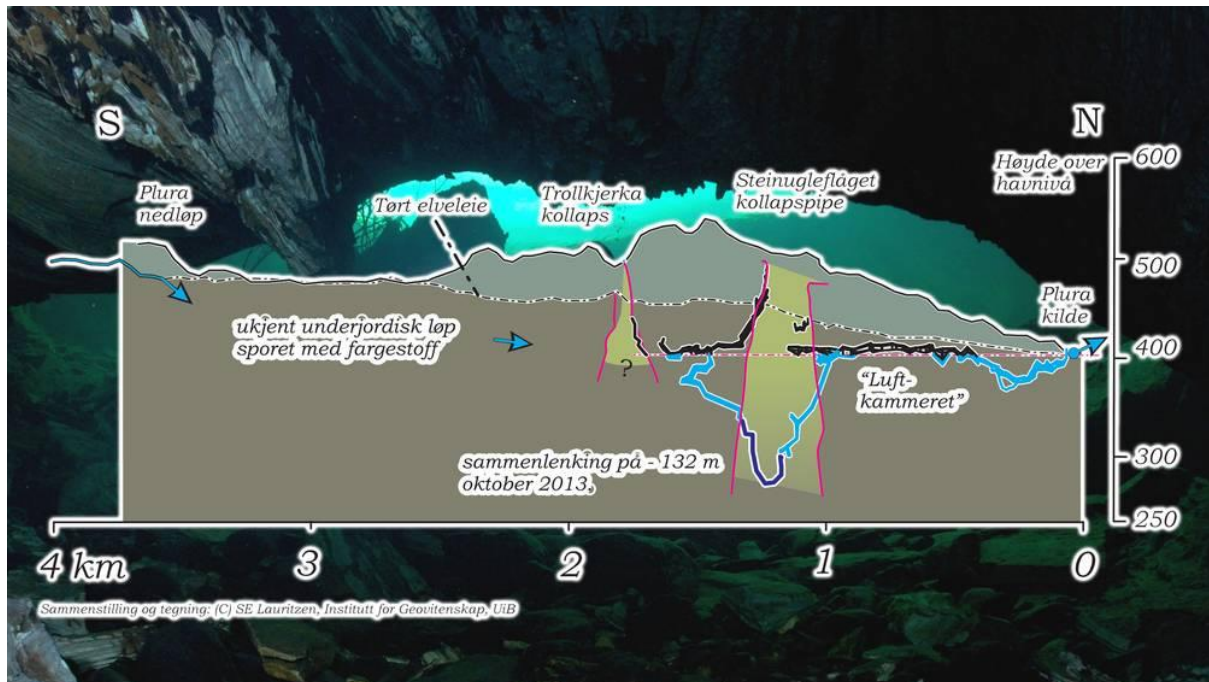
Bubbelen spring

NIKAS - Møsabekken spring



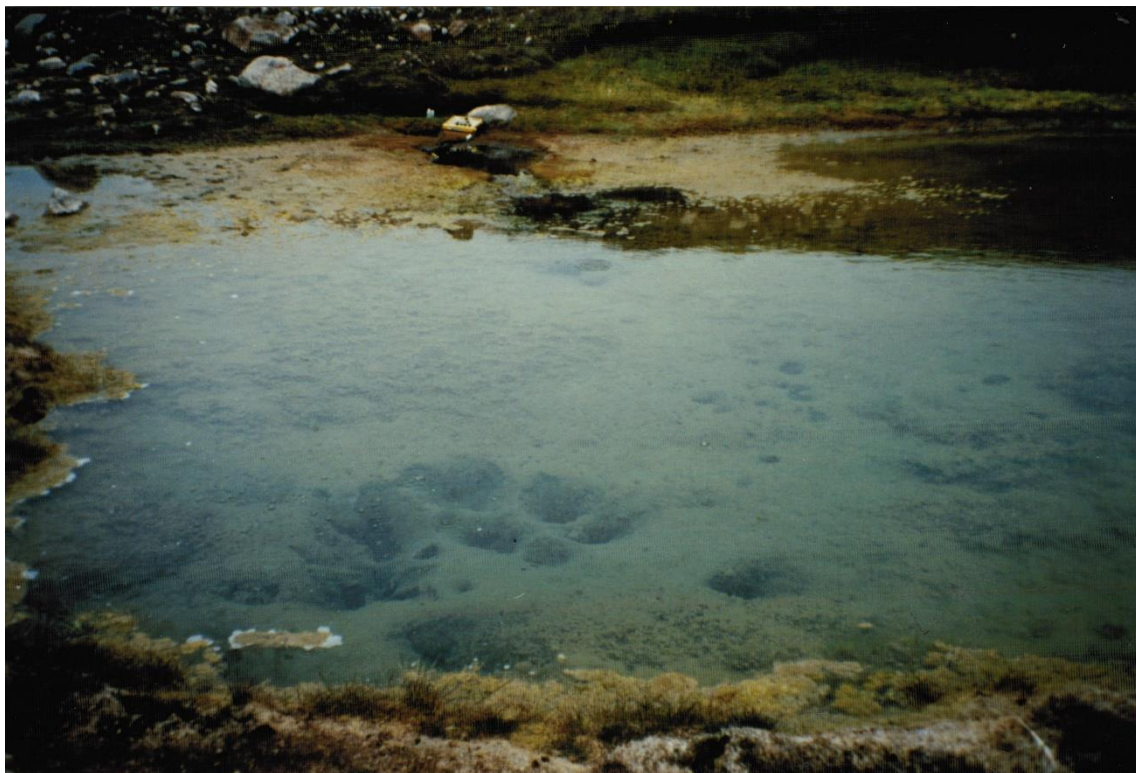
Møsabekken spring

NIKAS – Plura spring

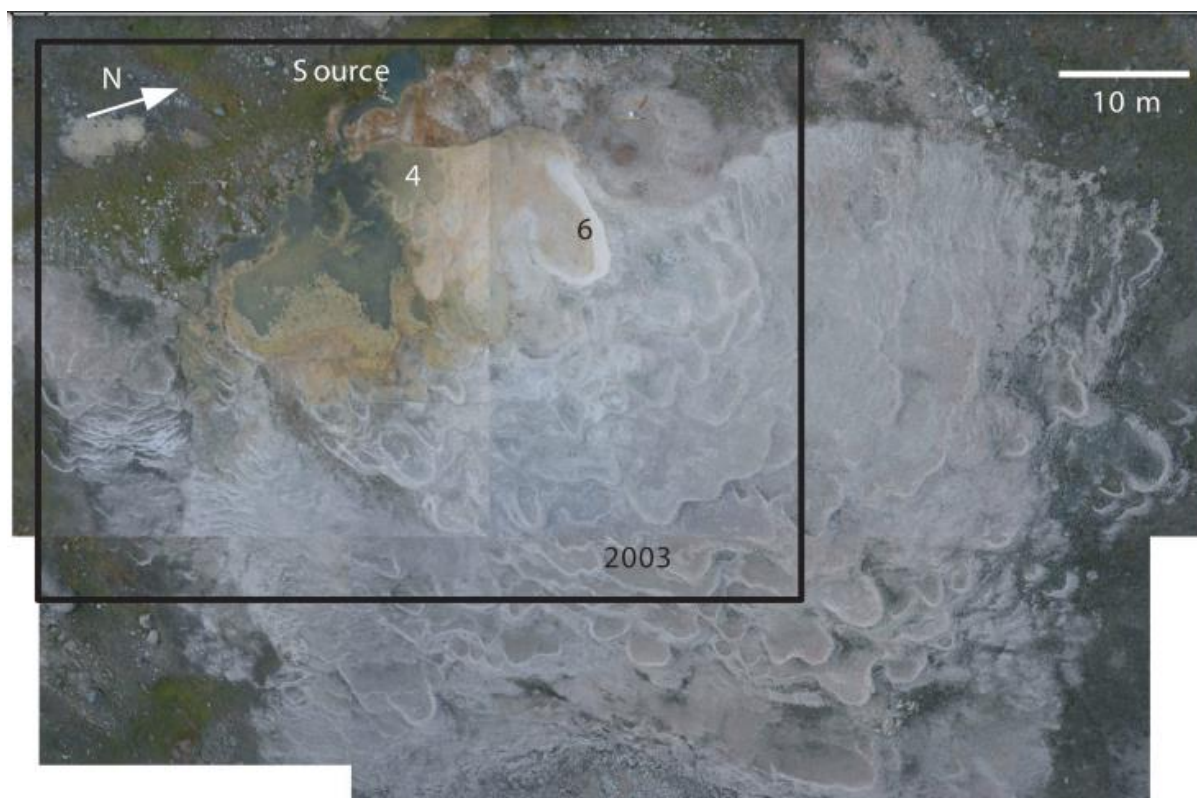


Map of Plura cave system by SE Lauritzen, and photo by Heidi Marie Nordahl

NIKAS – Troll and Jotun springs



Hot spring 2A4ii (2A4i in background), Trollkjeldene, Bockfjord, July 1996



(b)

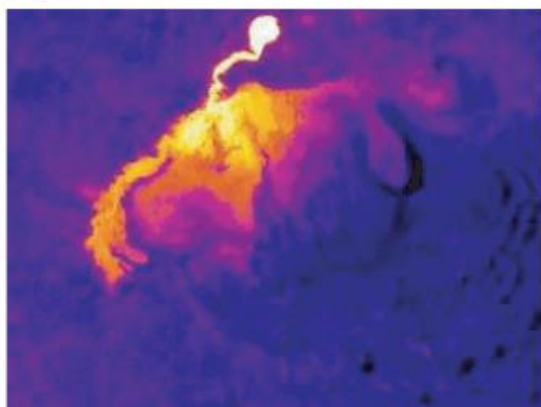


Fig.2: a) Overview images of the main Troll spring with associated travertine terraces taken from helicopter using a Nikon D100 SLR camera with 2000x3000 pixels. The spring source is near the upper edge of the picture. Flooded regions around the spring source are seen as green or brown areas. The colors are produced by bacterial growth in wet regions. Field of view: 100 m. b) Infrared image of the flooded region around the spring source taken with an FLIR S40 infrared camera with 320x240 pixels on a microbolometer focal plane array with sensitivity better than 0.1°C. The temperature ranges from 5°C (dark blue) to 25°C (bright yellow). The temperatures were confirmed by ground readings using a resistance thermometer.