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The borehole 2Alpes-3065 – a pilot installation for fiber optic DTS measurements in permafrost

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A 100 m deep borehole was drilled in September 2010 through permafrost ground in the upper part of the ski resort Les Deux Alpes, in the French Alps (Massif des Ecrins, 45°00'00" N / 6°11'30" E, 3065 m asl). The borehole is equipped for ground temperature measurement and is a key site of the French PermaFRANCE, of the Alpine PermaNET, and of the global GTN-P permafrost monitoring networks.

In addition to a standard thermistor chain instrumentation (30 PT100 at standard GTN-P depths), the borehole is equipped with an optic fiber, to simultaneously measure using the innovative distributed temperature sensing (DTS) technique. A 700 m long fiber optic cable has been placed in two loops. One first loop has been installed on the outside of the plastic tube and pushed down the borehole with the tube. A second loop has been placed inside the plastic tube, together with the thermistor chain. This setting will permit to measure both the temperatures in direct contact with the ground and those inside the open tube, to detect possible influence of air convection in the tube.

The redundant sensor systems will permit to compare the coherence of classical thermistor and DTS measurements. The two devices have different and complementary characteristics. The thermistors are read every few hours by a logger, which gives a high resolution record of temperature evolution, but only at a limited number of vertical levels. The DTS technique gives a temperature value every meter over the whole cable length, but only on specific dates, when the measurement unit is hooked up to the fiber in the field.

The equipment and first results will be presented.

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