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Niphargus: a silicon band-gap sensor temperature logger for high-precision environmental monitoring

Christian Burlet, Yves Vanbrabant, Kris Piessens, Kris Welkenhuysen, and Sophie Verheyden

Royal Belgian Institute of Natural Sciences, Geological Survey of Belgium, Brussels, Belgium (christian.burlet@naturalsciences.be)

A temperature logger, called "Niphargus", was developed at the Geological Survey of Belgium to monitor temperature of local natural processes with sensitivity of the order of a few hundredths of degrees to monitor temperature variability in open air, caves, soils and rivers. The newly developed instrument uses a state-of-the-art band-gap silicon temperature sensor with digital output. This sensor reduces the risk of drift associated with thermistor-based sensing devices, especially in humid environments. The Niphargus is designed to be highly reliable, low-cost and powered by a single lithium cell with up to several years autonomy depending on the sampling rate and environmental conditions. The Niphargus was evaluated in an ice point bath experiment in terms of temperature accuracy and thermal inertia.

The small size and low power consumption of the logger allow its use in difficult accessible environments, e.g. caves and space-constrained applications, inside a rock in a water stream. In both cases, the loggers have proven to be reliable and accurate devices. For example, spectral analysis of the temperature signal in the Han caves (Belgium) allowed detection and isolation of a 0.005˚C amplitude day-night periodic signal in the temperature curve.

Figure 1: a Niphargus logger in its standard size. SMD components side. Photo credit: W. Miseur