Comparison between different gas bearing structures; indicators, methods and first results.

**Transects**

At each sampling station soil gas was taken from a depth of one metre by using a metal tube.

**Helium**

The samples (20 ml) have been analysed with a portable mass spectrometer (modified helium mass detector, ASM 1/2; Esdo). The measuring principle bases on detecting the counts of helium atoms passed the mass spectrometer by the counter flow principle. Due to the constant gas flux the soil or helium concentration is determined in relation to the atmospheric helium concentration.

**Radon**

The radon samples (100 ml soil gas) have to be transferred into a scintillation cell (lucite cell), where the decay of radon is stopped by a scintillation crystal and can be counted by a photomultiplier (lucite detector, soil R4).

**Carbon dioxide**

The concentration of carbon dioxide of the soil gas (% per volume) has been measured with a multi gas monitor Geokon X-tra 7000 after taking the helium and radon sample. The background of carbon dioxide depends on soil type and the activity of soil biota. But carbon dioxide values above 30 % are generally caused by a changing geogenic process.

To determine gas bearing zones by helium anomalies on upper and lower boundary has to be defined on the basis of the soil gas concentrations of the transect samples. The upper boundary 1.75 times the background concentration and the lower boundary the 25th percentile - 1.5 IQR. The method is used contrary to the roof mean square deviation, because of its resistance against outliers.

**Thermografie**

Infrared Thermography was used to detect a thermal influence of the gas flux on the surrounding soil at meteorites. Because of the cooling during night the method was used in the early morning. In this period the temperature gradient from gas flux to soil should be the highest.

Infrared Thermography is an imaging method to detect variations of temperature in a defined area. The used Camera (FLIR E625) operates at an electromagnetic spectrum from 7.5 to 13 μm.

The calculated minimum of the radiation emitted soil and gas flux was about 13 μm. The influence of the gas flux on the temperature of the surrounding soil could not be clearly detected. As reasons, the low thermal energy transported by the gas flux, the influence of soil humidity, wind and cloudiness could be identified. In addition to these factors, the differing cover of vegetation and the specific emissivity complicated the interpretation of the measuring results.

**Monitoring**

For a better understanding of degrading processes observations of geochemical variations has been carried out in the East Elbe volcanic field known for the seismic unrest due to ongoing tectonic magnetic activity.

A multi-parameter monitoring station was installed at this gas containing mineral spring Elisabethbrunnen near Mendig. The monitoring station core device was a mass spectrometer (Bodas H2100) sensitive for helium. Helium in the tree gas phase of the mineral water and escaping in atmospheric air as a helium standard (225 ppm) were measured continuously. Beside the high temporal resolution (2 min) time series of helium concentration, the radon content and the gas flux of the tree gas phase were recorded. Furthermore the water parameters electric conductivity, temperature and discharge as well as climatic parameters have been logged.

**Wells and meteorites**

Samples of the tree gas phase of several mineral springs and meteorites in the East Elbe region and the Machtitz valley were have been analysed regarding the 3He and 3He.

The spatial distribution of helium show strong differences in the helium concentration ranging from 4,990 to 173,985 petasolit meteorites differ different uplift rates of the individual sampling locations. A general trend to high values in the southern part of the investigation area can be observed. Apart from this trend strong small scale variability occurs in nearby springs.

**East Elbe**

Elisabethbrunnen Monitoring period from May 25th to July 17th 2000. Temperature variations in helium are related to the meteorological variable or pointed by the uplift movement in the well. Observed changes in helium show a wide correlation to the trends. Definitive changes in the time series (e.g., 2000-2001) are not yet fully understood.

The spatial distribution of helium concentrations at the East Elbe region and the Machtitz valley is shown.