

# Water Dynamics (also Thermal) Under (and On) the Ground and Good Measurements for Use in Simulations.

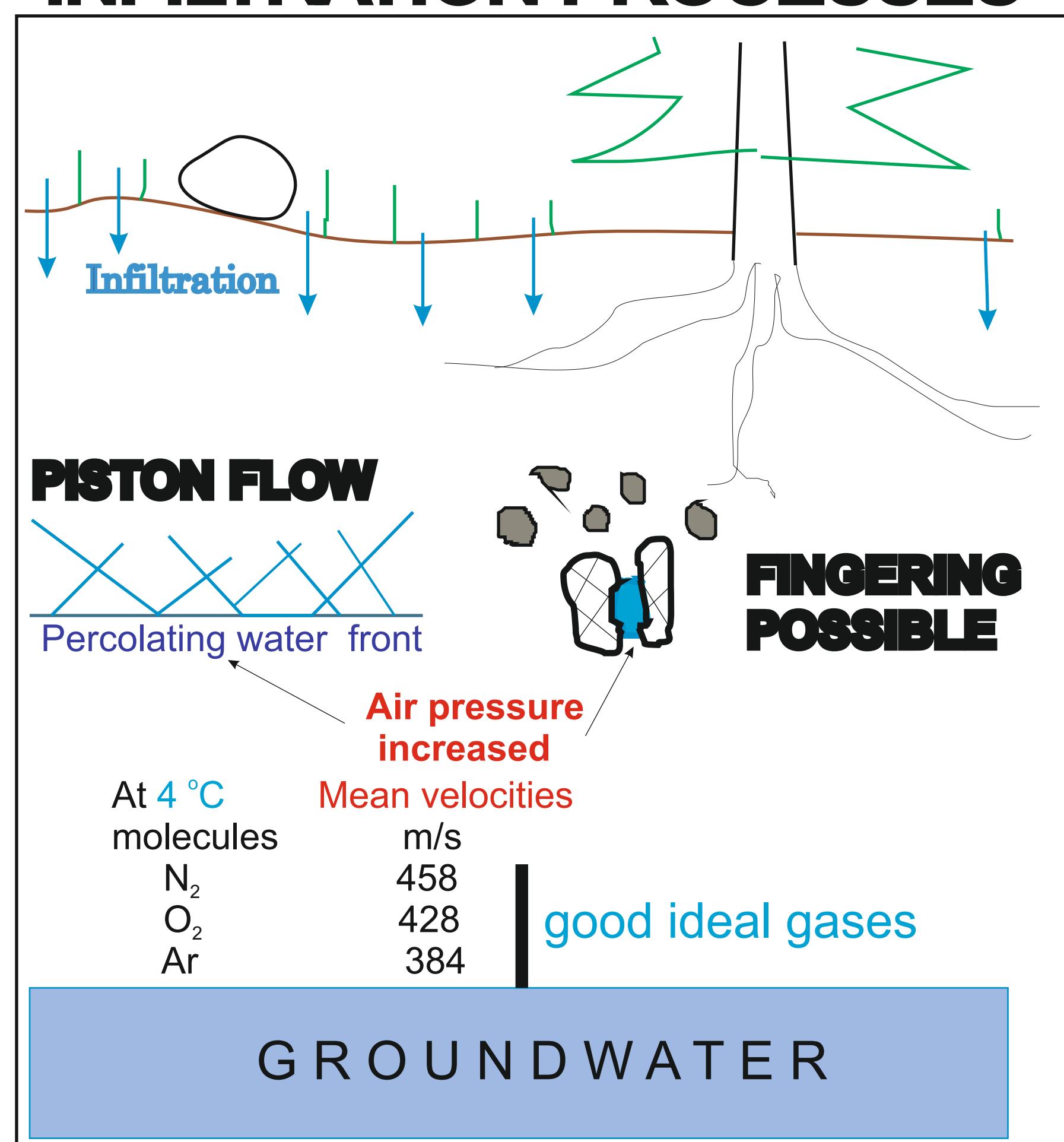
Servo KASI

In Physics days 2008, Turku, Conference Hotel Caribia, 27.3.

ogy

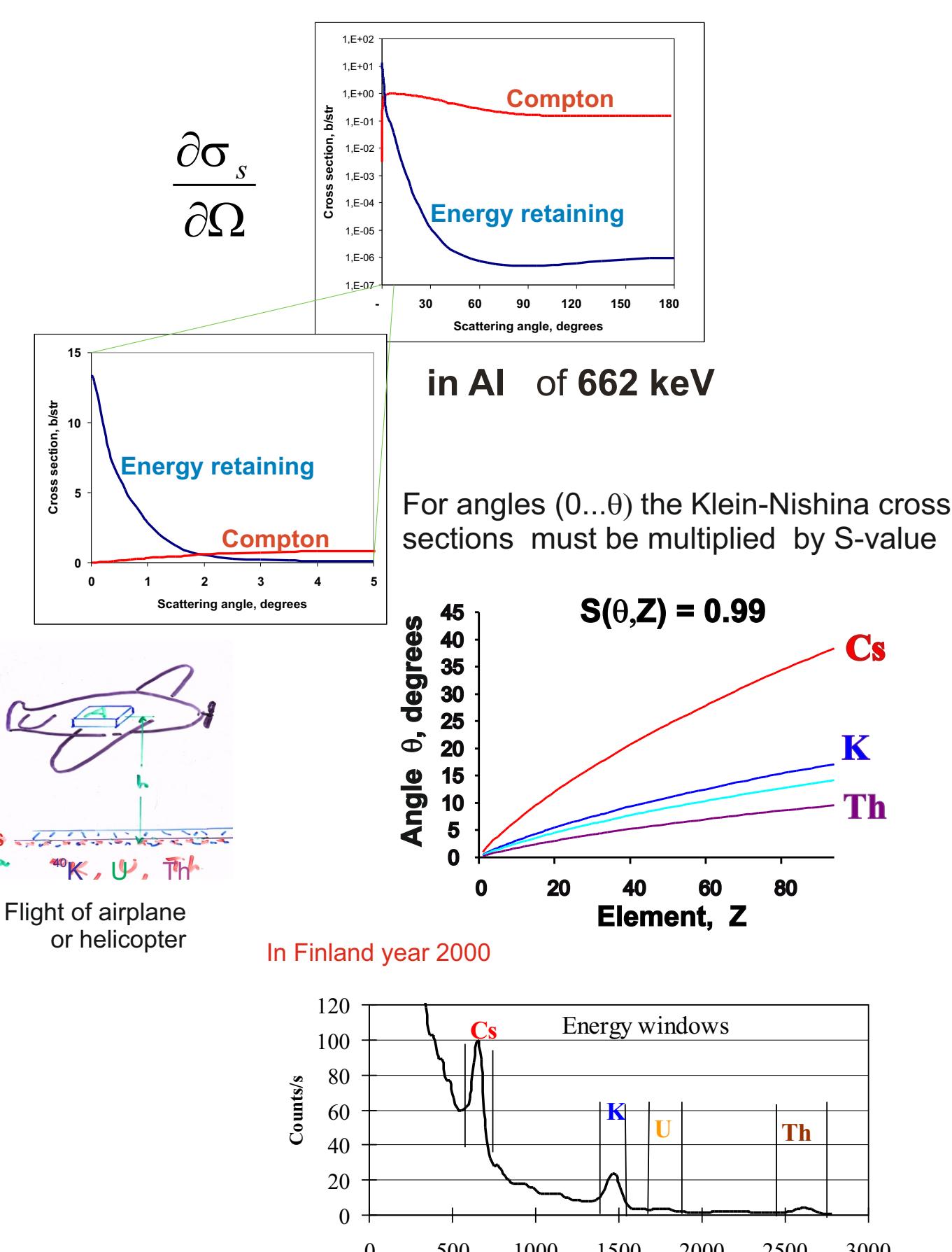
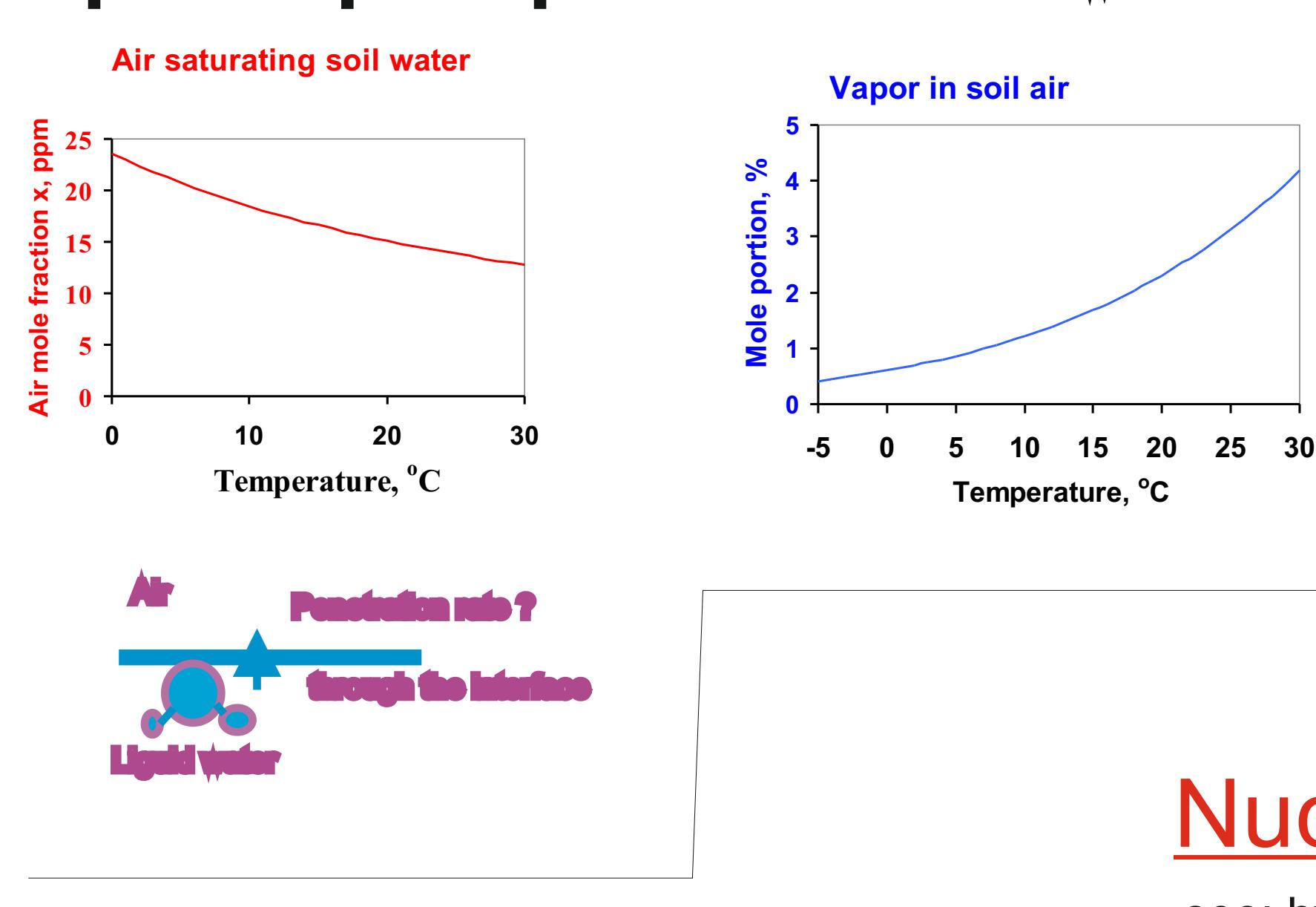
Water has cycles under the ground (xy-coordinates) as well as above ( $\pm z$ ?).

## INFILTRATION PROCESSES



Water infiltration is hindered by soil air.

### Temperature dependent processes in soil air and water



## SOIL WATER and AIR OBSERVATIONS

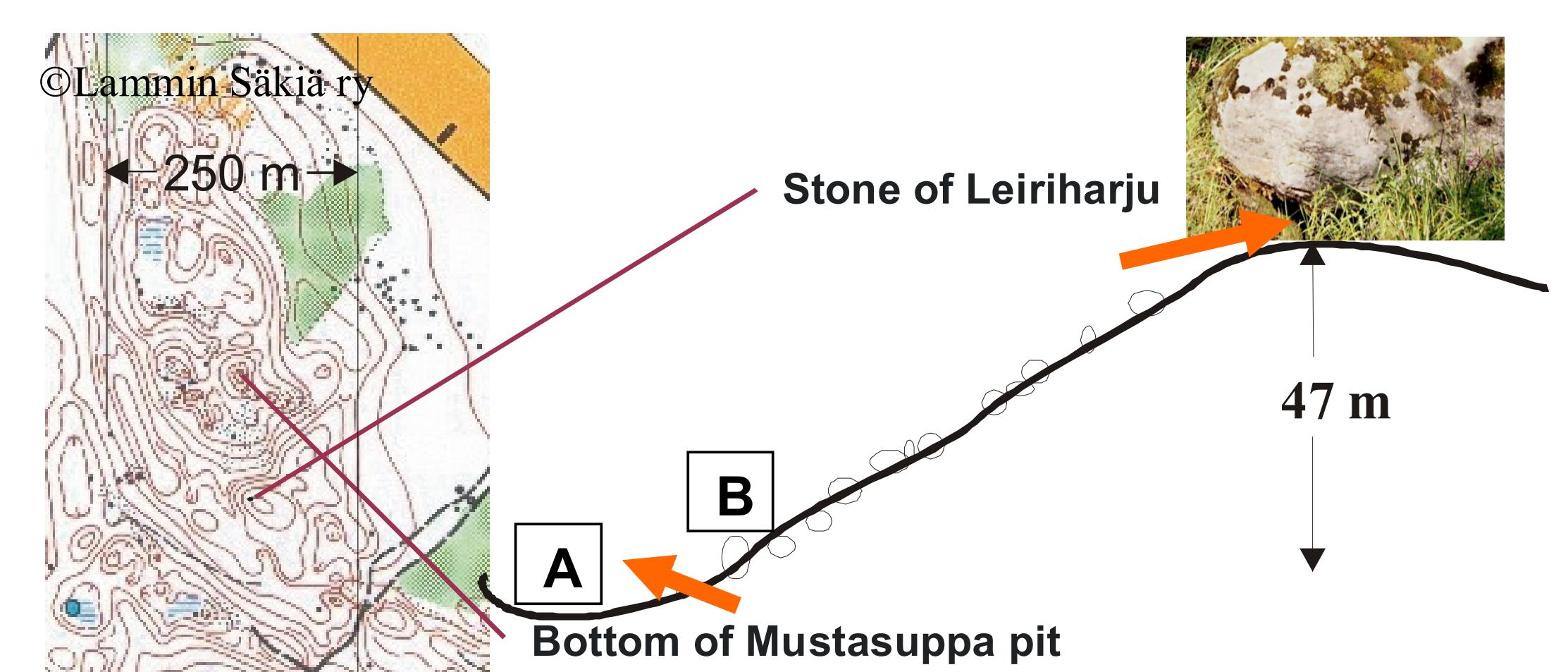
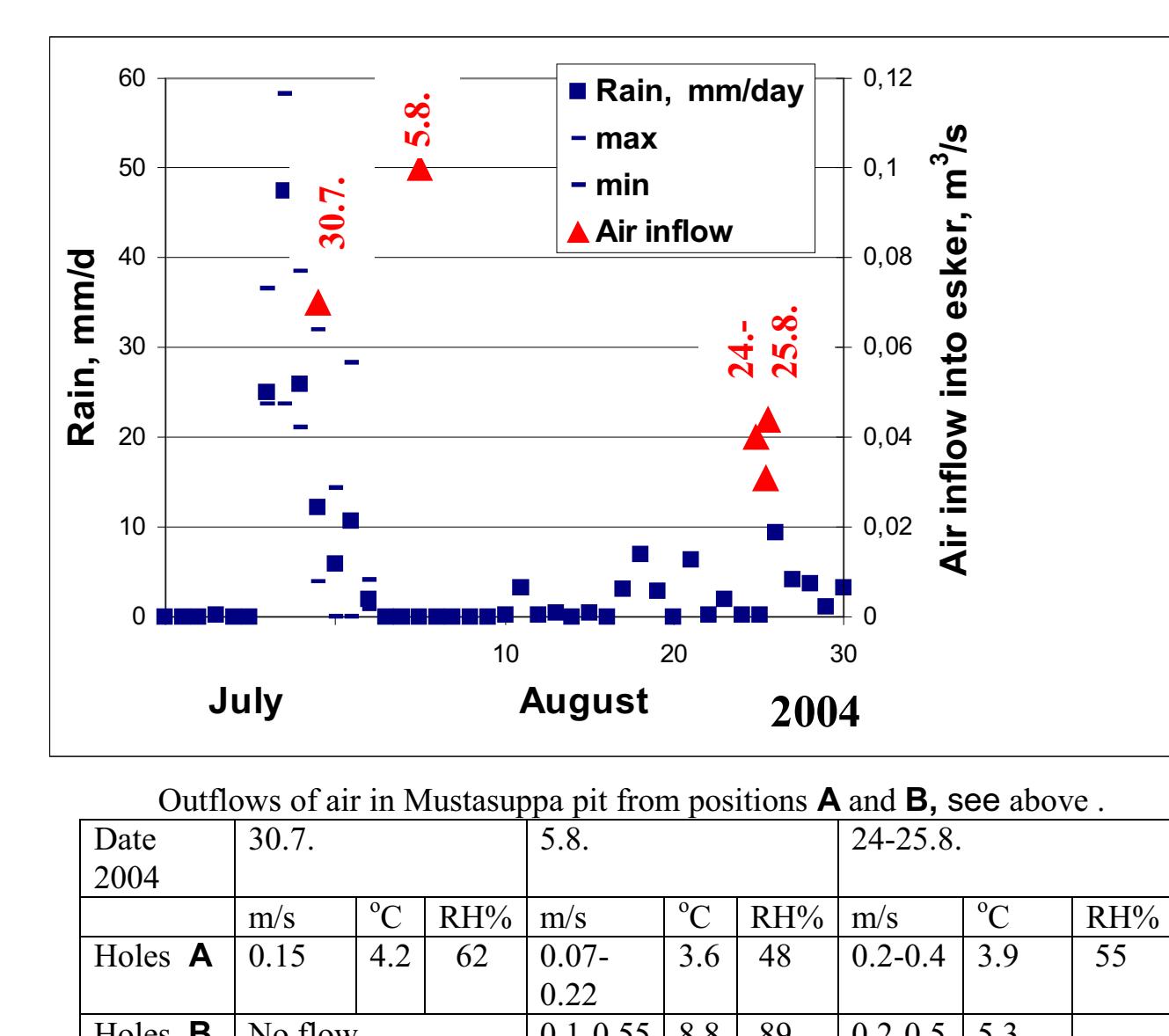
Ice layers inside hills in the middle of summer

observation at this site in 1913



and later in other hills and eskers.

### Air flows in similar eskers



## Nuclear measurements for soil moisture and snow mass determinations

see: <http://www.mv.helsinki.fi/home/skasi/G10.pdf>

In winter we have water storage in snow. The snow mass (kg/m<sup>2</sup>) can be measured by soil gamma radiation, and the cesium from Chernobyl seems also to be a tool for the determination of soil moisture below the ground in the first desimeters. The cesium stabilization in soil should be confirmed by new measurements. After 1986 I measured nondestructively also other Cs-profiles in southern Finland than in my 2001 paper. My 2005 Physics Days poster presents the map of Cs-deposition most sharply among my publications.

The chemical bindings in and temperature of matter do not cause errors in gamma measurements. In simulations of the kind of measurements itself I presented the poster G10 in the 10th ISRP of the IRPS (International Radiation Physics Society) in Coimbra in Portugal in 2006.

Gamma photon scatterings:

Stokes parameters

polarisation effects

Rayleigh scattering is energy-retaining (-holding) and very sharply on small angles.

Compton scattering tail near the zero angle seems to be very small.

**Acknowledgement:** MVTT (Maa- ja Vesitekniikan Tuki ry) is a fund for research in soil and water technique, and I have had the pleasure to have its support: 2003, for Measurement of Mustansuppa esker summer ventilation, 2004, for Participation in Nordic Hydrological Conference in Tallinn, 2006, for Participation in Nordic Hydrological Conference in Denmark.