**II) DESCRIPTION OF THE MODELS:**

### A) GLOBAL SCALINGS FROM EARTH TO VENUS:

Equation (1) implies the assumptions of equal mechanisms of interior heat transport, thermal structure, heat production rate, composition, etc.

\[
q_{\text{Venus}} = 0.815 q_{\text{Earth}} \quad (1)
\]

Based on equation (1) (with \(q_{\text{Venus}}\) and \(q_{\text{Earth}}\) as the mean heat flows of the planets and 0.815 as the mass ratio between Earth and Venus) Solomon S. C. and Head J. W., 1982 [2] and Turcotte D. L., 1995 [3] have estimated the global mean surface heat loss on Venus to be 78 mW m\(^{-2}\) and 63 mW m\(^{-2}\), respectively.

### B) CATASTROPHIC/EPISODIC RESURFACING MODEL:

The catastrophic resurfacing model given by Turcotte D. L., 1993 [4] assumes a strong time-dependent heat loss with periods (with a duration of ~150 Myr) of extensive heat loss due to plate-tectonics and/or hot-spot-volcanism. Thereby the last (global) event is assumed to have occurred about 500 Myr ago, whereby this value is due to the estimated age of the surface given by the crater distribution. Since the last resurfacing event only thermal conductivity in this model is responsible for the surface heat loss. Thus the present surface heat flow can be estimated according to equation (2) (with \(k\) as the thermal conductivity, \(T_m\) and \(T_s\) as the mean mantle and surface temperatures respectively and \(t\) as the time since the lithosphere was stabilized: the mean surface age) and resulted in an amount of heat loss of about 11 mW m\(^{-2}\).

\[
q_{\text{Venus}} = k(T_m - T_s) \quad (2)
\]

In our present understanding this value seems to be too low, because it is lower than the two measurements on the Lunar surface (14 mW m\(^{-2}\) and 21 mW m\(^{-2}\)) and consequently would rule out any recent volcanic activities.

### C) PARAMETERIZED CONVECTION MODELS:

- Phillips R. J. and Malin M. C., 1984 [5]: a model with no core heat component and with the greatest open questions in self-induced amounts of ~50 mW m\(^{-2}\)
- Arkani-Hamed J. and Toókez M. N., 1984 [6]: various model calculations with the assumptions that 90% of the heat-producing elements are concentrated in the outer 120 km of the planet, with a constant density regime, without mantle phase transitions and that the surface temperature has not undergone any changes up to the present, resulted in amounts between 42 and 80 mW m\(^{-2}\)
- Solomatov V. N. and Morelli L. N., 1996 [7]: a first result was achieved by a model with constant viscosity conditions (no stagnant lid); resulted in 50 mW m\(^{-2}\)
- Solomatov V. N. and Morelli L. N., 1996 [7]: a second result was given by a model, where the constant viscosity regime is switched to a stagnant lid regime about 0.6 Gyr ago (after the switch the surface flux and lithospheric thickness are purely controlled by diffusion cooling of the lithosphere); ~15 mW m\(^{-2}\)

### D) CAPACITIES OF THE HEAT TRANSPORT MECHANISMS:


Venusian Corona structures pose the equivalent to terrestrial hot-spots and in this manner the surface manifestation of a mantle plume than the contribution to mean surface heat loss due to Coronae (and their subtypes: Arachnoids and Nova) can be estimated by equation (3), with \(c_p\) and \(c_v\) as the density and the specific heat of the volcanic material, \(f\) as the fusion heat of the magma, \(T_m - T_s\) as the temperature difference between the eruption temp. and the surface temp., \(dV/dT\) as the volumetric flux of magma with time and \(n_p\) as a weight-factor for all presumably active plume-induced structures at present (Leith J. J., 2005, [10]). Thus Corona-volcanism contributes ~6 ± 1.4 mW m\(^{-2}\) to the mean surface heat loss.

\[
q_{\text{Corona}} = n_p(f(c_p T_m + H_f)/dV/dT) \quad (3)
\]

**III) SUMMARY OF THE RESULTS:**

- Global scaling models: 63 and 78 mW m\(^{-2}\)
- Catastrophic/episodic resurfacing models: 11 mW m\(^{-2}\)
- Parameterized convection models: between 15 and 80 mW m\(^{-2}\)
- Stagnant lid model: 15 mW m\(^{-2}\)
- Non-stagnant lid model: 50 mW m\(^{-2}\)
- Heat transport capacities: 39.5 ± 1.4 mW m\(^{-2}\)

**IV) DISCUSSION:**

In contrast to the values given by the global scaling models and the catastrophic model, which are too high (and not consistent with the observed geology) and too low respectively (because they would rule out any tectonic or volcanic activity), the result due to a consideration of the transport capacities of the separate mechanisms seem to be a reasonable estimation of the global mean surface heat loss on Venus at present and in a good agreement with the observed surface features.

**V) REFERENCES:**