

The Thermal Radiation of the Atmosphere and its Role in the so- called Greenhouse Effect

Thomas Allmendinger, June 2018 Paris

Glattbrugg / Switzerland

<http://allphyscon.ch>

Thomas Allmendinger: The Thermal Radiation of the Atmosphere (1)

Introduction

The topics of contemporary publications about climate usually deal with delivering further evidence for climate warming and its impacts on the one hand, and with the objective of how the results of climate science can be transformed into political actions on the other hand. Besides, they are always based on the assumption that these results are correct.

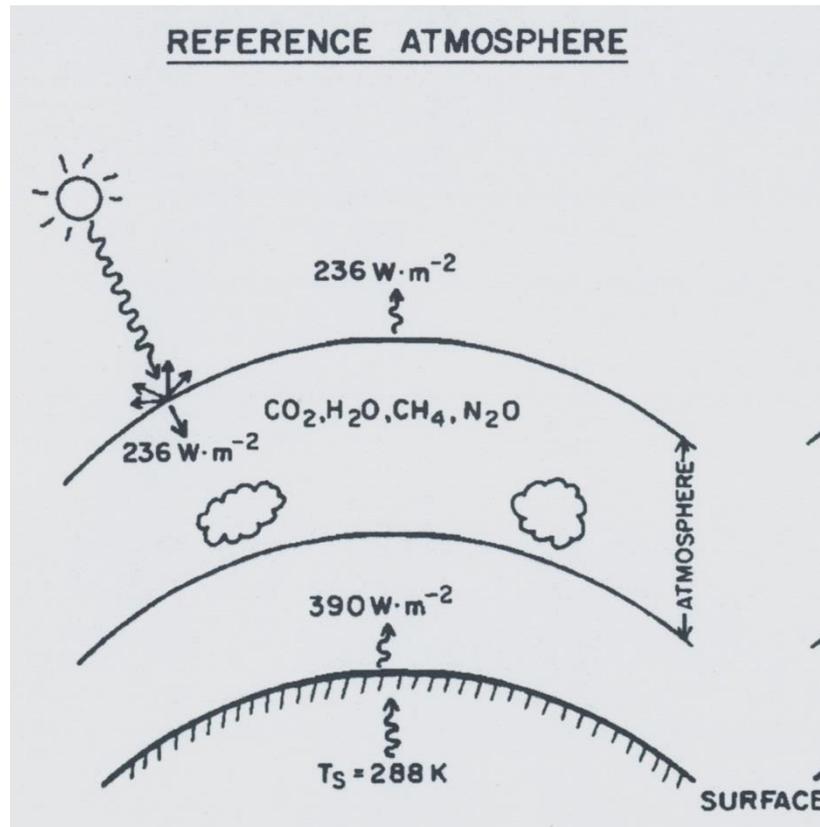
However – as my own research has yielded -, this is not at all the case. The respective argumentation is not only based on theoretical objections, but also – and not least - on measurements applying novel detection methods.

In particular, the key assumption of the predominant greenhouse theory, that carbon-dioxide (or further «greenhouse gases») is responsible for global warming, turned out to be completely wrong. Instead, the so-called *albedo* of the Earth's surface represents the governing factor which can be influenced by artificial measures. This albedo indicates the portion of the solar light which is reflected on the Earth's surface into the atmosphere and finally into space. The not-reflected solar light is absorbed by the Earth surface leading to a temperature rise which is transported to the lowest layer of the atmosphere. But the conventional greenhouse theory disregards this heat transfer at the boundary, instead of considering the absorption of the thermal Earth's radiation by the *whole* atmosphere, and assuming that only «greenhouse gases» can act as absorbers. Moreover, it disregards the counter-radiation of the atmosphere onto the Earth's surface.

For investigating such problems, the central question has to be answered: How and to which extent infrared *radiation* energy is transformed into *heat* energy of gases, and vice versa? This question has never been asked so far; but it could be answered by using the proposed methods.

The Conventional Greenhouse Theory (CGT)

Ramanathan V. et al. (1987), *Reviews of Geophysics* 25/7, 1441-82:



Presumptions of the CGT:

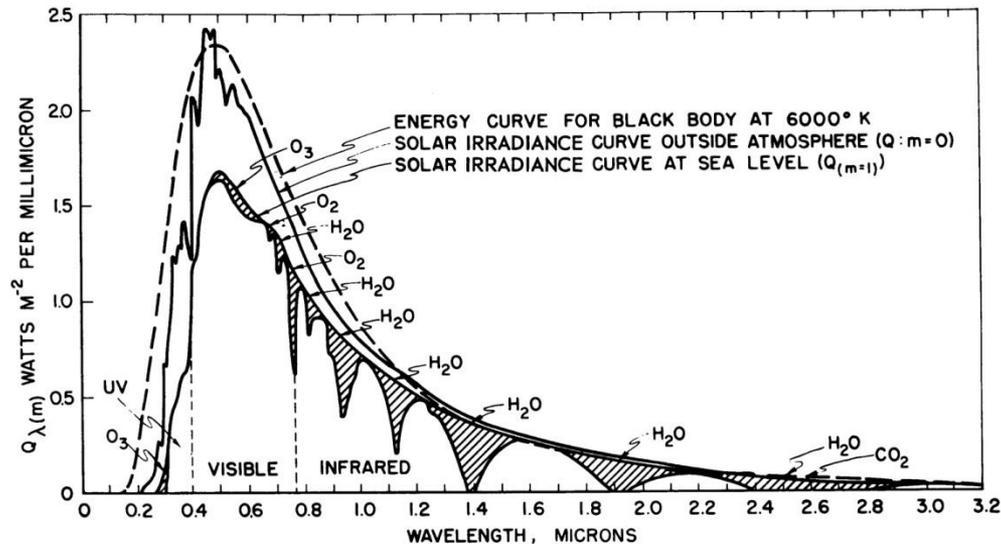
- The atmosphere is **solely** warmed up by the thermal blackbody-radiation of the Earth surface, which is warmed up by incident solar radiation
- This atmospheric warming-up is **solely** due to «greenhouse gases» such as CO₂
- For the surface temperature of the Earth, a **global average value** of 288 K = 15°C is assumed
- The incident solar radiation is **not** absorbed by the atmosphere, at least not in the IR-range

Objections against the CGT:

- Not the whole atmosphere is primarily relevant for climate, but solely its **lowest layer**
- Besides the thermal radiation of the Earth's surface, an additional **heat transfer soil-air** occurs
- The intensity loss of the incident solar light passing through the atmosphere lets suppose an **absorption**
- CO₂ **cannot** be relevant for climate warming due to its very low concentration in the air (0.04 %)
- It is **not permissible** to operate with a global average temperature because of the numerous deviations due to latitudes, altitudes and temporal fluctuations

Absorption Spectra of Solar Light

Reference: Howard J.N., King J.I.F., and Gast, P.R. (1960!): Thermal Radiation (Chapter 16), *Handbook of Geophysics*, THE MACMILLAN COMPANY New York, 16-15



The relative intensities of such published terrestrial spectra are questionable since they depend on the altitude, the sea level and the presence of clouds and mist

Paradox:

Why is it cooler on mountains, even if there the solar light intensity is larger than at lowlands?

e.g. own measurements in Switzerland, June/July 2017:

- Glattbrugg (near Zurich), 430 m above sea level:
1080 Wm⁻² / 26.7°C (ca. 13 h)
- Furka (mountain-pass), 2430 m above sea level:
1235 Wm⁻² / 16.9°C (ca. 13 h)

The Thermal Radiation of the Earth's Surface and the Counter-Radiation of the Atmosphere

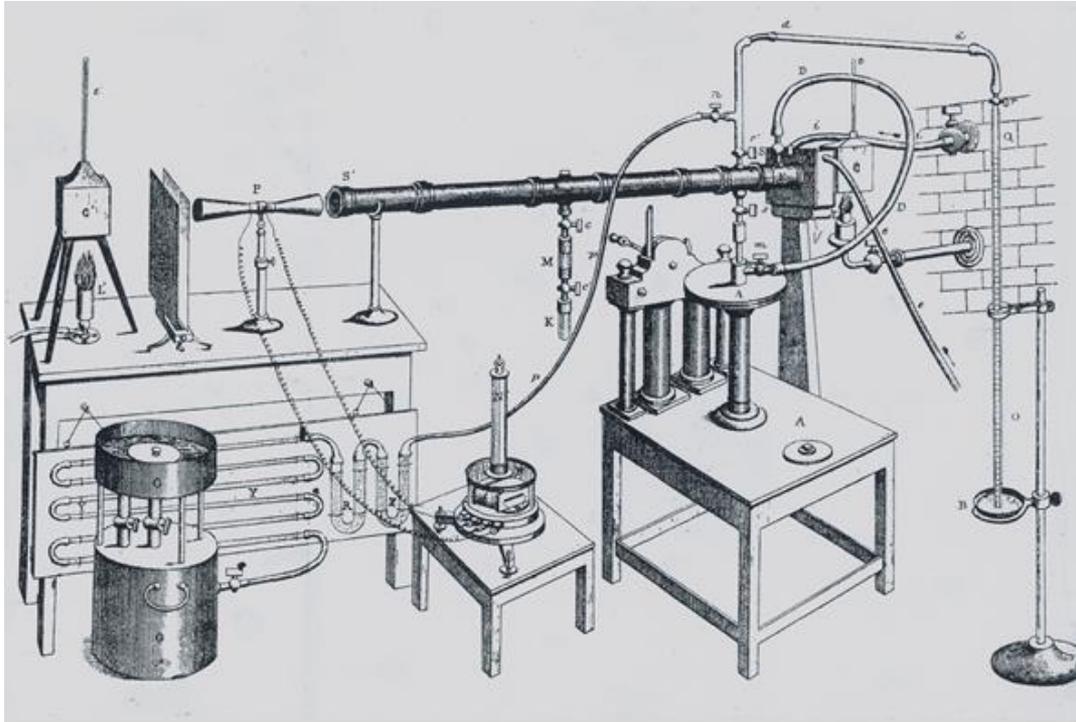
- **Stefan-Boltzmann Emission Law for Blackbodies:**

$$\Phi_{\text{soil}} = \Phi_{\text{BB}} = \sigma \times T_{\text{soil}}^4 \quad (T = \text{absolute temperature})$$

If $T = 288 \text{ K} \rightarrow 390 \text{ Wm}^{-2}$ (cf. initial CGT schema)

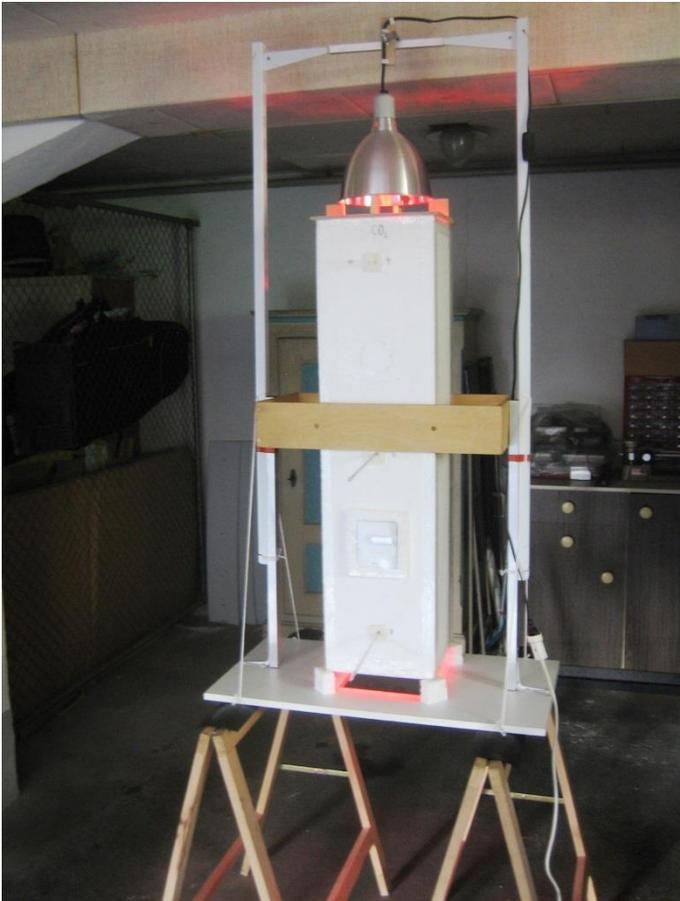
- Which is the intensity of the **counter-radiation of the atmosphere**? Does it obey the same emission law, yielding the well-known formula $\Phi = \sigma(T_{\text{soil}}^4 - T_{\text{atm}}^4)$?
- Why is it - within the CGT - positioned **outside** the atmosphere, instead of **inside**, at the Earth's surface?

The Original Absorption Measurements of Thermal Radiation by John Tyndall (1861 et seq.)

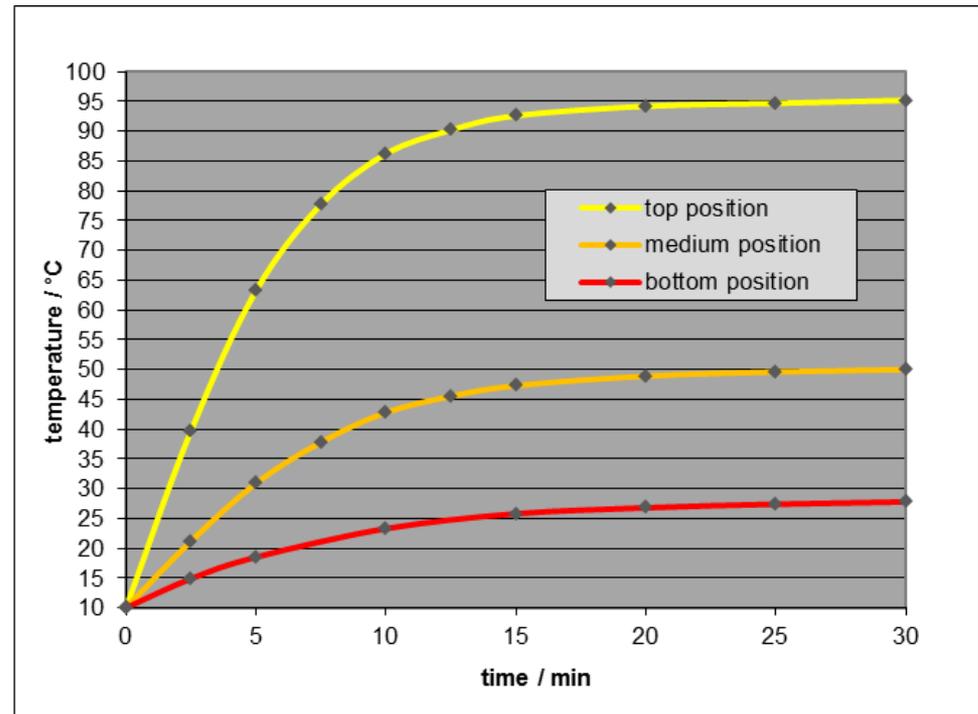


- Heat sources: **Leslie cubes**
- Detection of the **intensity loss** (and **not** of the warming-up!)

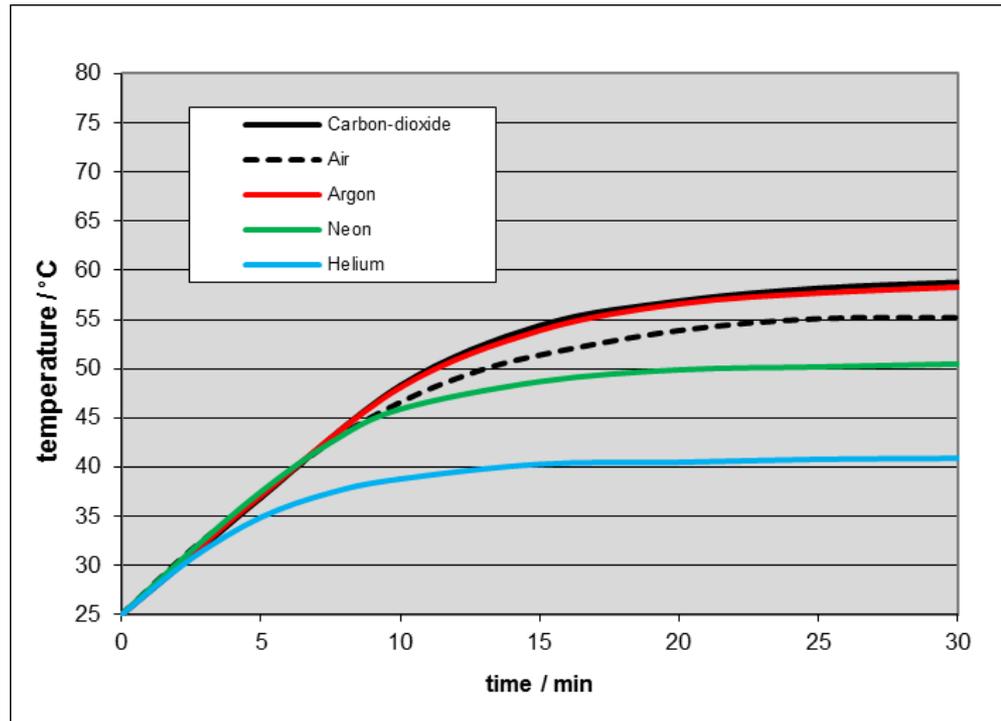
Thermal Absorption Measurements using a Styrofoam-Tube and an IR-Spot (e.g. 150 W)



Time-/temperature-curves at different thermometer positions:



Thermal Absorption Measurements with an IR-Spot: Comparison of Different Gases (150 W, intermediate thermometer position)



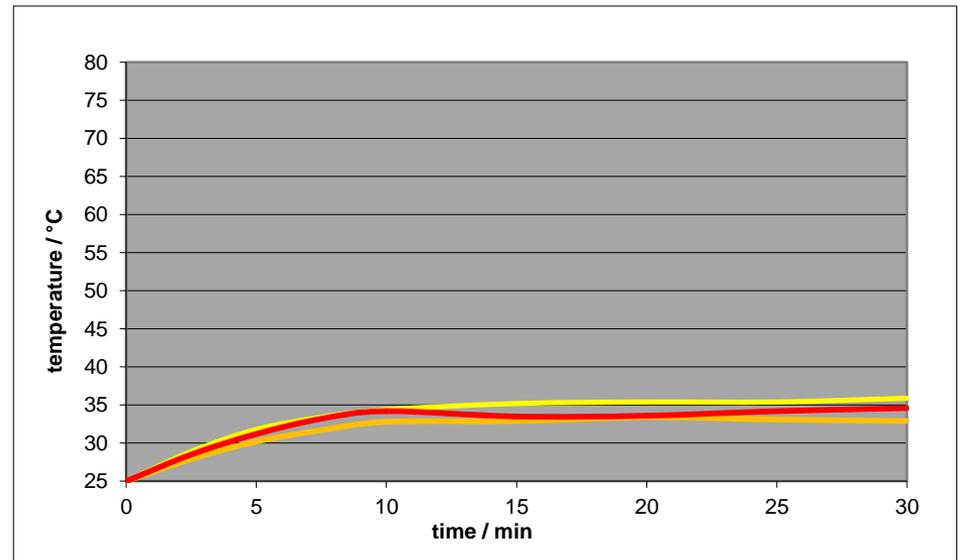
Thermal Absorption Measurements with an IR-Spot: Analysis of the Results

- When the **limiting temperature** is reached, the radiative emission intensity is identically equal to the radiative absorption degree
- Hypothesis: The **emission intensity** is proportional to the **collision frequency of the molecules**
- Applying the kinetic gas theory, the comparison of the noble gases argon, neon and helium yields the dependence on the **atomic cross sectional area**, the **pressure** and the **root of the absolute temperature**

Thermal Measurements with a Solar Tube



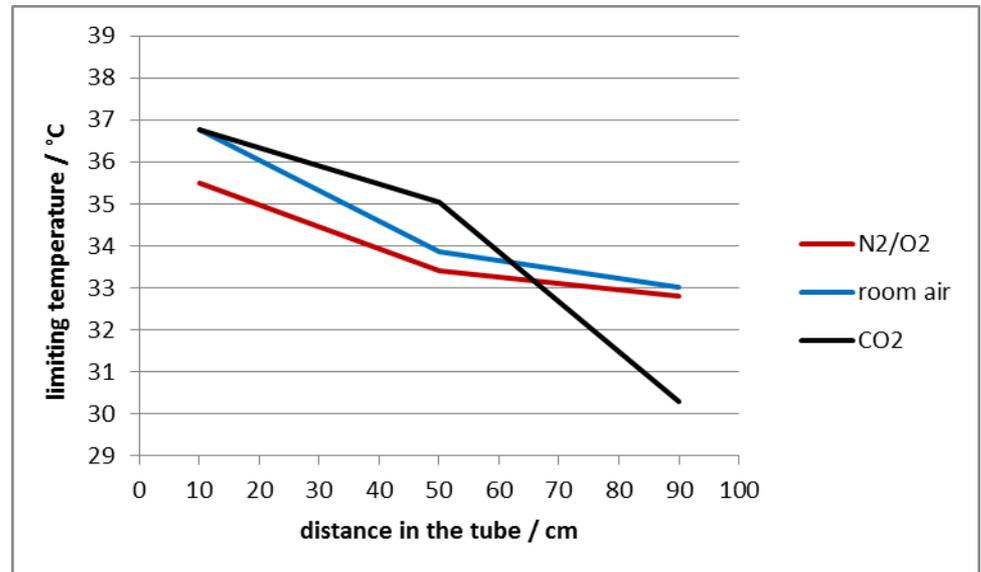
Time-/temperature-curves at different temperature positions



Thermal Measurements with a Hot-Plate



Limiting temperatures for different gases at different positions (heat power 37.1 W, initial temperature 23.5°):



The Novel Atmospheric Emission Law

- **Hypothesis:** The counter-radiation of the atmosphere at the Earth's surface obeys the same regularity as found with the IR-spot-experiments:

$$\Phi_{\text{atm}} = A \times p_{\text{atm}} \times T_{\text{atm}}^{1/2} \quad (A = \text{atmospheric emission constant})$$

- **Consequence:** When a coloured solid opaque body (SOB) is irradiated by solar light, and when a **steady radiation equilibrium** is reached, the absorbed part of the solar light must be equal to the difference between the black-body-radiation of the SOB and the counter radiation of the atmosphere:

$$\Phi_{\text{solar}} \times \beta_{\text{solar}} = \sigma \times T_{\text{SOB,eq}}^4 - \Phi_{\text{atm}}$$

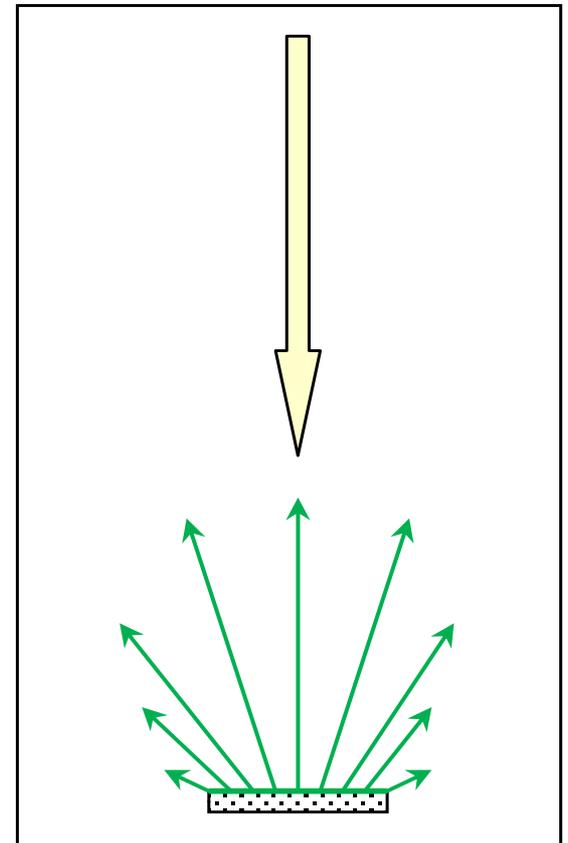
$$\beta_{\text{solar}} = \text{solar absorption coeff.} = 1 - \alpha_{\text{solar}} \quad (\text{solar reflection coeff.})$$

Measurement of the Solar Absorption Coefficient β_s

- Customary method: measuring the solar *reflection* coefficient (or albedo) α_s , defined as the quotient reflected/incident light-intensity, e.g. with an albedometer (left pic), yielding $\beta_s = 1 - \alpha_s$



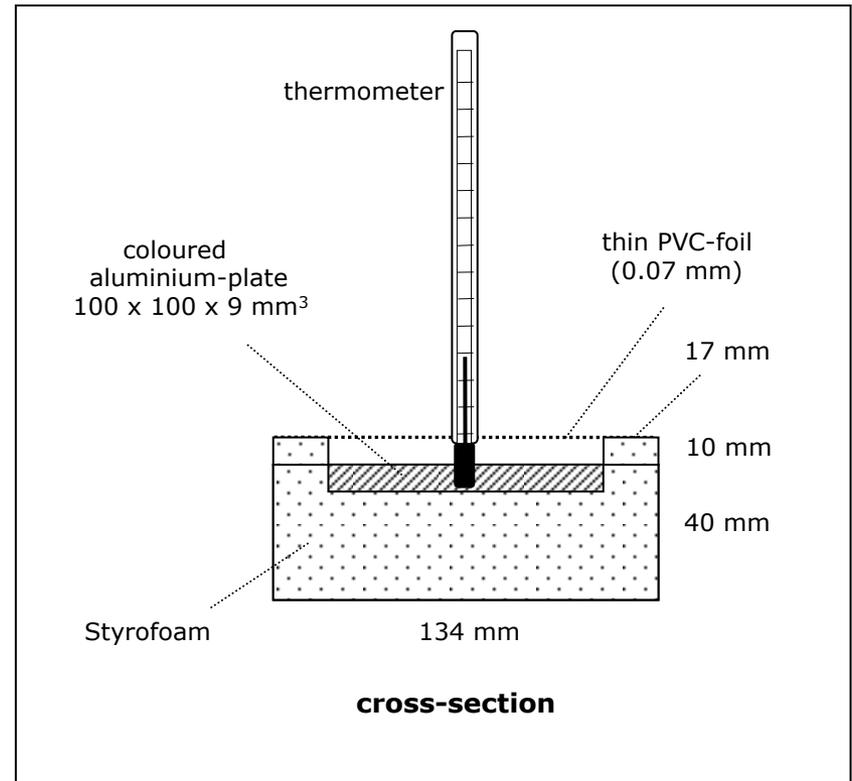
- Inaccuracies due to light dispersion (right pic)
- Preferred *direct* determination of β_s by temperature measurements at irradiated aluminium-plates (own novel method, cf. page 17)



How can the atmospheric radiation constant **A** empirically be determined?

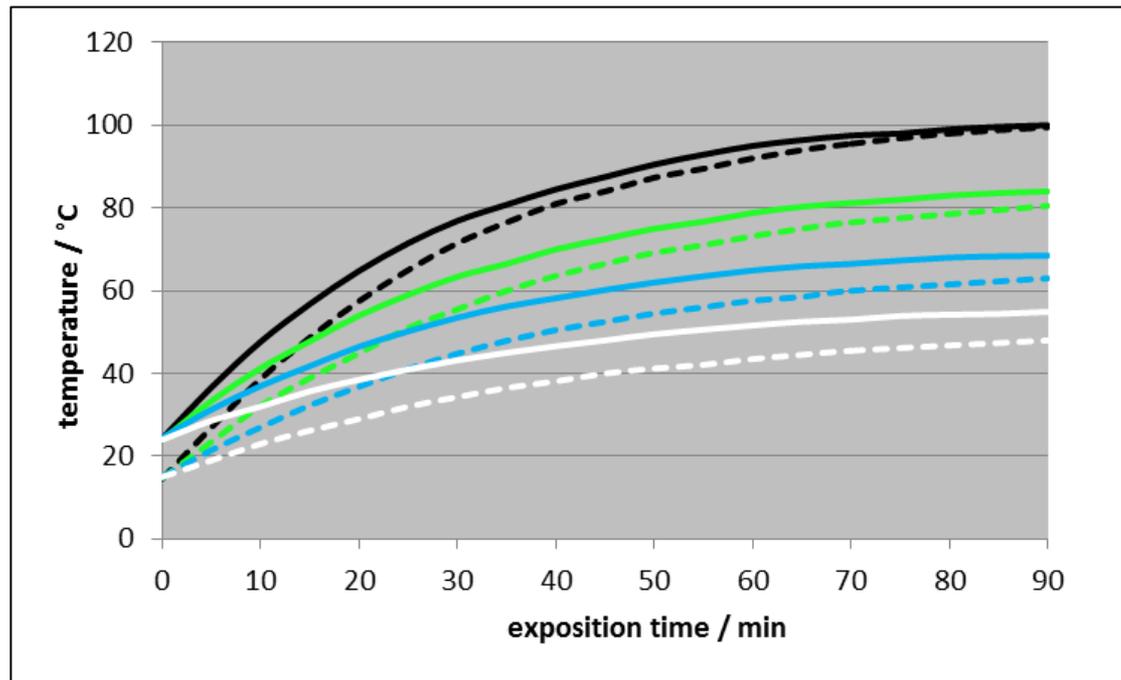
- When a plate of a solid opaque body is irradiated by sunlight, it is warmed up to a **limiting temperature**, depending on the surface colour of the plate. When this temperature is determined, together with the atmospheric pressure and the ambient atmospheric temperature, and when the solar intensity is known (measured with an electronic «solarmeter»), **A** can be easily computed
- The value of **A** can be verified (a) by using differently coloured plates and (b) by varying the atmospheric pressure, using locations with different sea levels (lowland - mountain)

Measuring Equipment



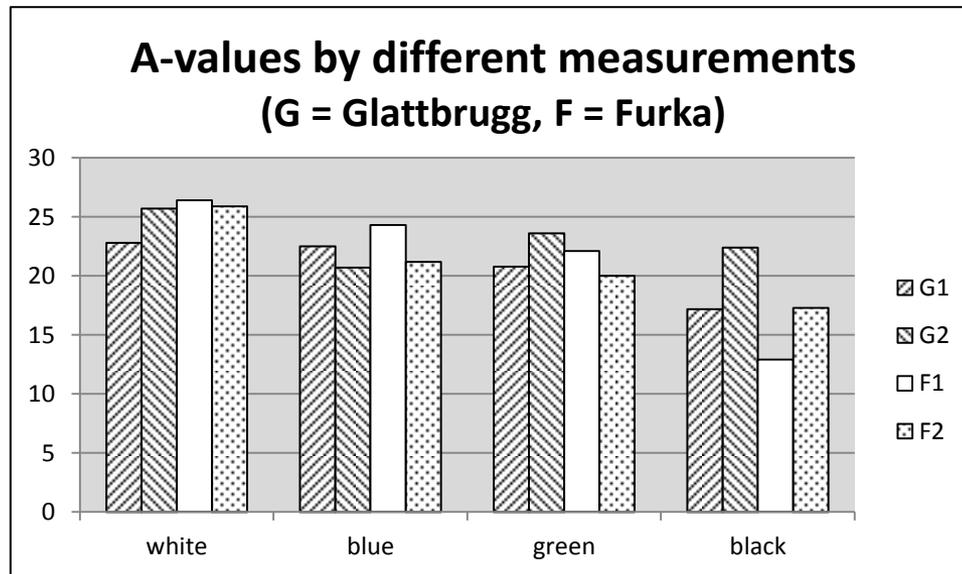
Results: Time-/Temperature-Curves

- continuous lines: Glattbrugg (430 m above sea level, 0.948 bar)
- dotted lines: Furka-Pass (2430 m above sea level, 0.738 bar)



Evaluation of 2 x 2 Measurements:

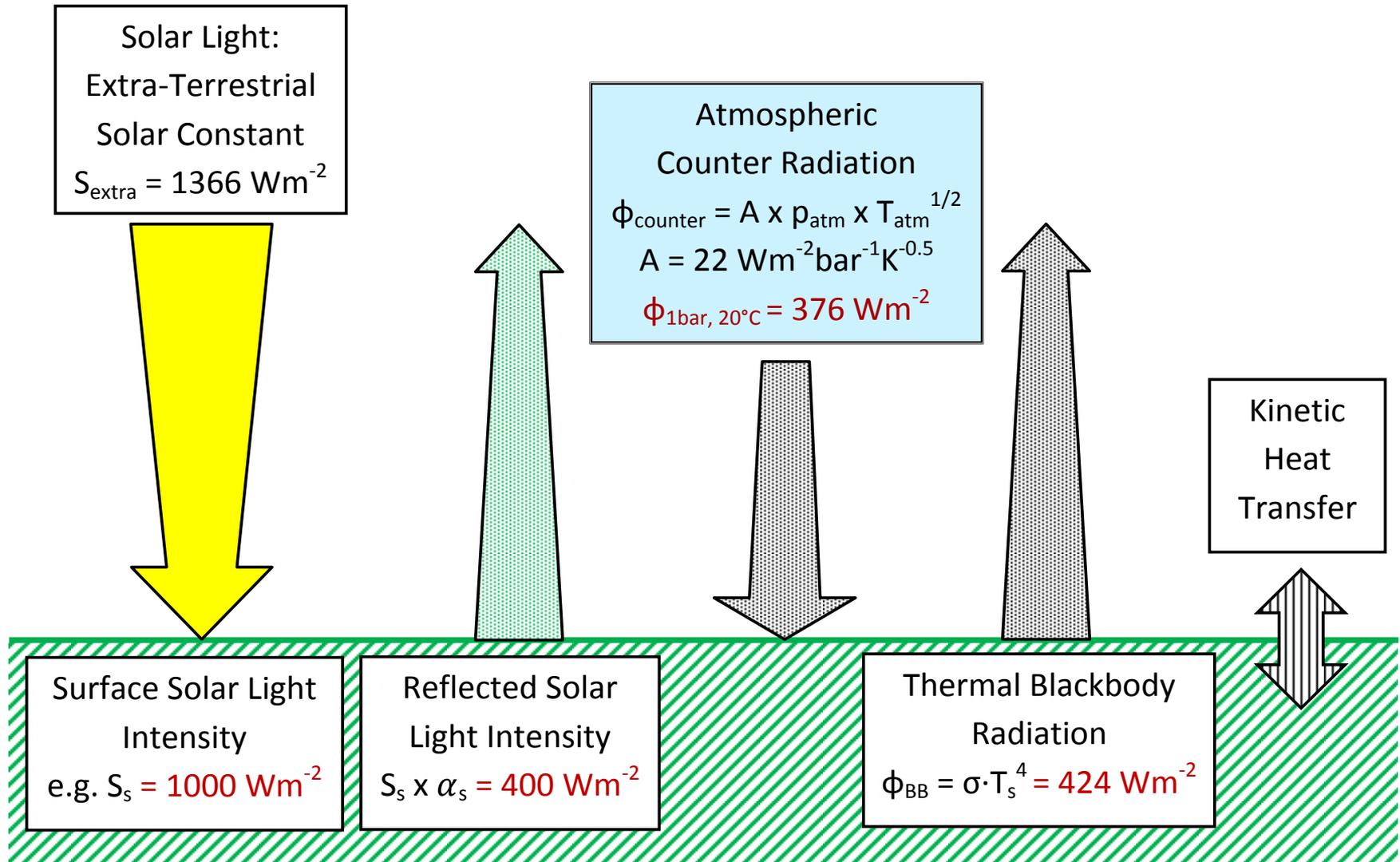
Determination of the A-values (unit: $\text{Wm}^{-2} \text{bar}^{-1}\text{K}^{-0.5}$)



chosen average value: $22 \text{ Wm}^{-2}\text{bar}^{-1}\text{K}^{-0.5}$

Atmospheric Radiation Schema at the Earth's Surface

(coloured in red: exemplarily assumed values)



Conclusions and Consequences

- The counter-radiation of the atmosphere is directly proportional to the atmospheric pressure at the boundary of the Earth's surface
- A reduction of the counter-radiation leads to an intensified cooling-down of the Earth's surface since the relative portion of its thermal emission increases
- Carbon-dioxide or other so-called Greenhouse Gases do not have any influence on the climate
- The only feasibility of mitigating the climate consists in brightening-up surfaces and in reducing the macro-roughness, particularly in (mega-)cities

New York (1)



New York (2)



New York (3)



Tokyo



Frankfurt



Beijing



Shanghai



Singapur



Katar



Riad



São Paulo



Mexico-City



New Delhi



Brown-Coaling in Cottbus



Solar Panels

