11^{th} IYPT '98
solution to the problem no. 6
presented by the team of Austria

Mount Everest

Can you see Mount Everest from Darjeeling?

Abstract

We found out, that geographically (mountains, spherical shape of earth) there are no "obstacles" in the line of sight. Besides we neglected dust and moisture (etc.) and assumed the RAYLEIGH-scaterring and used the LAMBERTS-law. Afterwards we calculated the decrease of the extinction coeficient with increasing altitude step by step. So we discovered that the distance between Mount Everest and Darjeeling is a critical one (due to scattering) and came to the conclusion: Under good weather conditions Mount Everest can be seen.

Overview

- Weather
- Scattering
- Refraction

1 Weather

- Distance Darjeeling — Mt. Everest: 165 km
  "Critical" distance at sea-level!
- Extinction coefficient decreases with increasing altitude, so the situation improves!
- We think: Under good weather conditions, Mt. Everest can be seen!
- Line of sight?
  - Spherical shape of earth
  - Mountains between Darjeeling and Mt. Everest ...

  Assuming: yes!

2 Scattering

- Reduction of light due to scattering
  - Neglect dust, moisture, ...
  - Assume **Rayleight-scattering!**
- Lambert's Law:

$$I(x) = I_0 \cdot e^{-\delta x}$$

δ ... extinction coefficient

- Rayleigh's formula:

$$\delta = \frac{8\pi^3}{3N\lambda^4}(n^2 - 1)^2$$

N ... particle number density
n ... refraction coefficient

3 Refraction

- Refraction coefficient and particle density:

$$(n^2 - 1)^2 \propto N^2 \rightarrow \delta \propto \frac{N}{\lambda^4}$$

- Extincition coefficient decreases with increasing altitude!
- Estimate particel density roughly.
- Numerical solution:
  - Light from Mt. Everest: 100%
  - Calculate decrease step by step

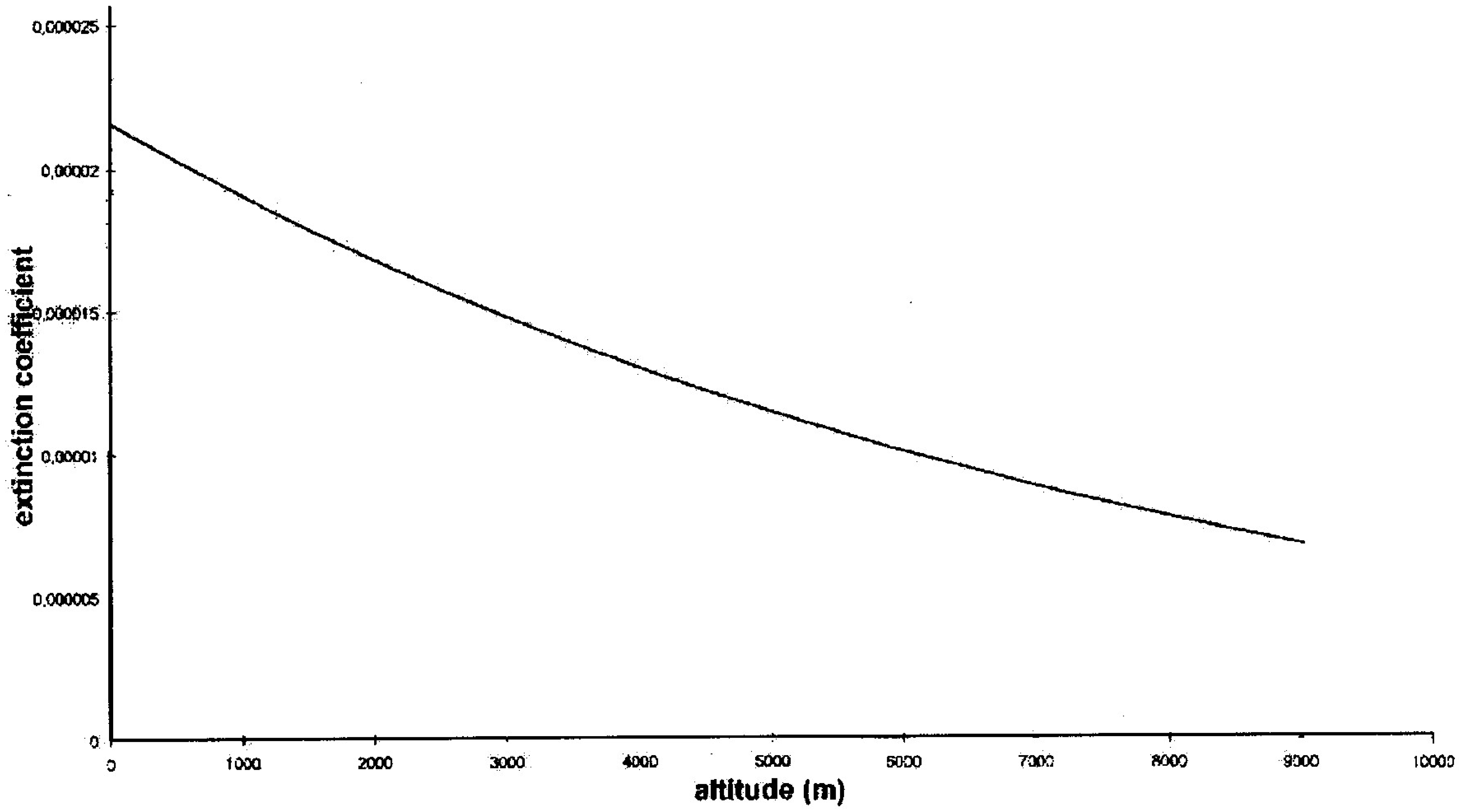

Figure 1: Extinction coefficient as a function of altitude (wavelength 500 nm)

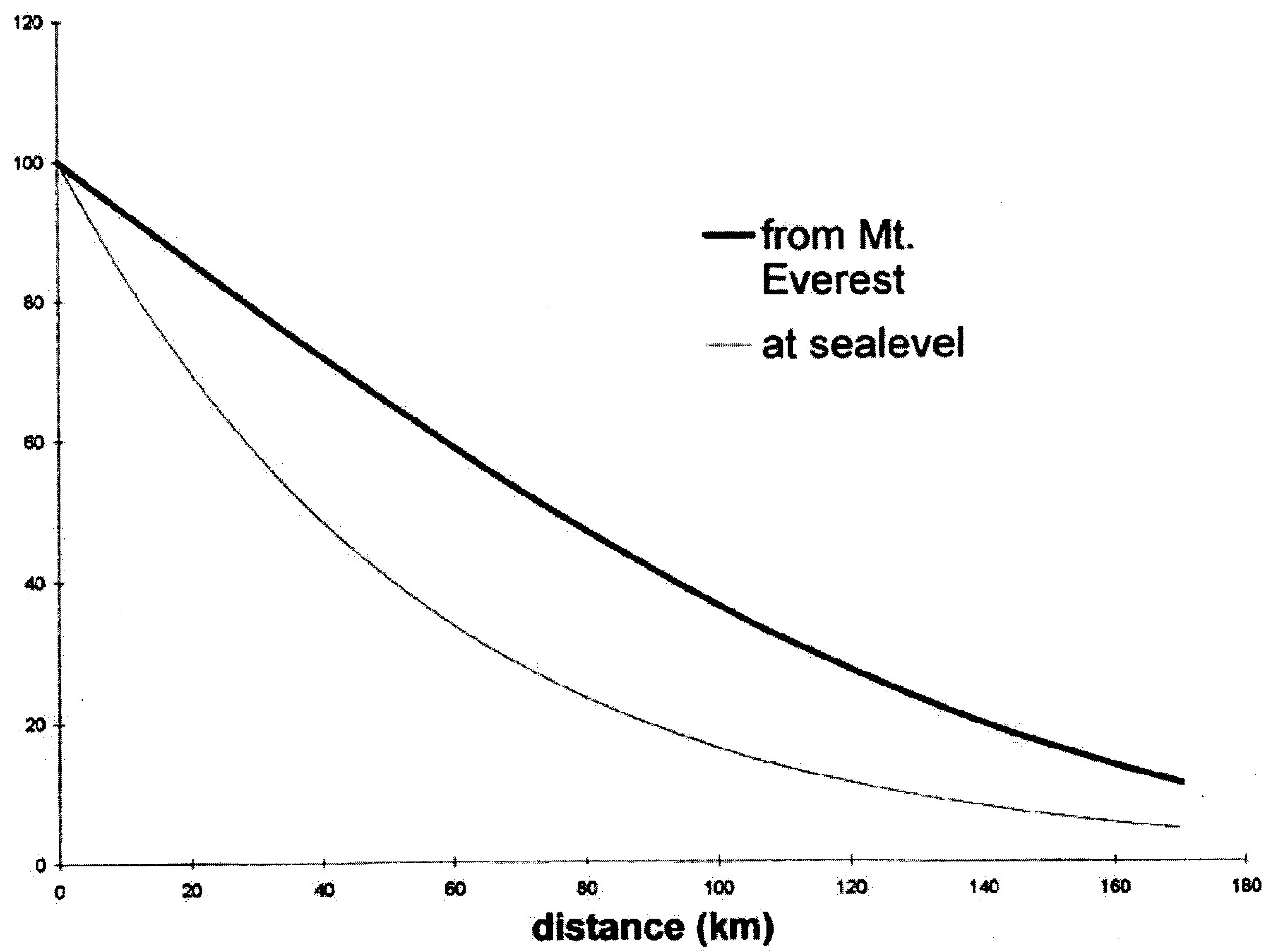

Figure 2: Relative Intensity of light as a Function of Distance (wavelength 500 nm)