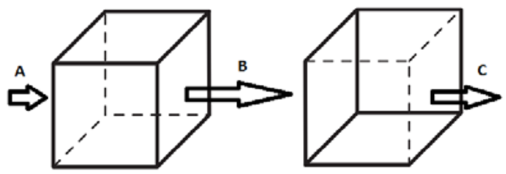

A ray of light passes through the two cubes from left to right. At **A**, the light ray has its full intensity of 100%.

After it leaves the first box, the aerosols have reduced the light intensity by 10% so that at B, the light intensity is 100% x (0.90) = 90%.

After passing through an identical aerosol region in the second box, the light intensity is reduced by an additional 10%. The final light intensity at C is then 100% x (0.90) x (0.90) = 81%.

Aerosols are small particles of liquids or solids that are light enough to be suspended in the air for long periods of time. Common aerosols can include dust from volcanoes, exhaust from jet plains, smog, or ash from the combustion of fossil fuels and wood. Most of the time you do not even notice they are there, unless they are present in large enough numbers.

When the concentration of aerosols is high enough, they can actually cause the dimming of sunlight, which is why the sky can appear darker on a foggy day (water aerosols) or very hazy on a day with lots of smog or distant forest fires.

The figure to the left shows how light dimming occurs, if the intensity of light is reduced by 10% as it passes through two boxes of air.

Problem 1 – Suppose in the above example, the light ray passes through 6 identical boxes. How bright will the light be after it leaves the sixth box?

Problem 2 – Suppose that each box is 1 kilometer on a side, and that the light is dimmed by1% through each box. If the total path is 20 kilometers, what will be the brightness of the light after it leaves this aerosol cloud to the nearest percent?

Problem 3 – A light ray passes through 5 kilometers of ordinary air, which reduces the light by 0.5% per kilometer, and then passes through a dense cloud that reduces the light by 5% per kilometer. If the cloud is 3 kilometers long, to the nearest percentage what will be the light intensity when the light leaves the cloud?

Problem 1 – Suppose in the above example, the light ray passes through 6 identical boxes. How bright will the light be after it leaves the sixth box?

Answer: 100% x 0.9 x 0.9 x 0.9 x 0.9 x 0.9 x 0.9 = 100% x $(0.9)^6$ = **53%**.

Problem 2 – Suppose that each box is 1 kilometer on a side, and that the light is dimmed by1% through each box. If the total path is 20 kilometers, what will be the brightness of the light after it leaves this aerosol cloud to the nearest percent?

Answer: There are 20 boxes along the light ray so 100% x $(0.99)^{20}$ = **82%**.

Problem 3 – A light ray passes through 5 kilometers of ordinary air, which reduces the light by 0.5% per kilometer, and then passes through a dense cloud that reduces the light by 5% per kilometer. If the cloud is 3 kilometers long, to the nearest percentage what will be the light intensity when the light leaves the cloud?

Answer: 100% x $(0.995)^5$ x $(0.95)^3$ = 100% x 0.975 x 0.857 = **84%**

Visibility and dimming: Typical morning fogs can attenuate light by 50% but there is still enough light to read a book, it's just that the light passing through the fog is scattered, which means that you cannot see an object clearly if it is more than a few hundred meters away.