

The background image shows a vast, icy landscape under a clear blue sky. The sun is positioned at the top center, emitting a bright, radial glow. In the foreground, numerous small icebergs and sea ice are scattered across the dark blue water. A faint rainbow-like lens flare is visible near the bottom center.

Global Warming

Lecture 3.3

Albedo

What is Albedo?

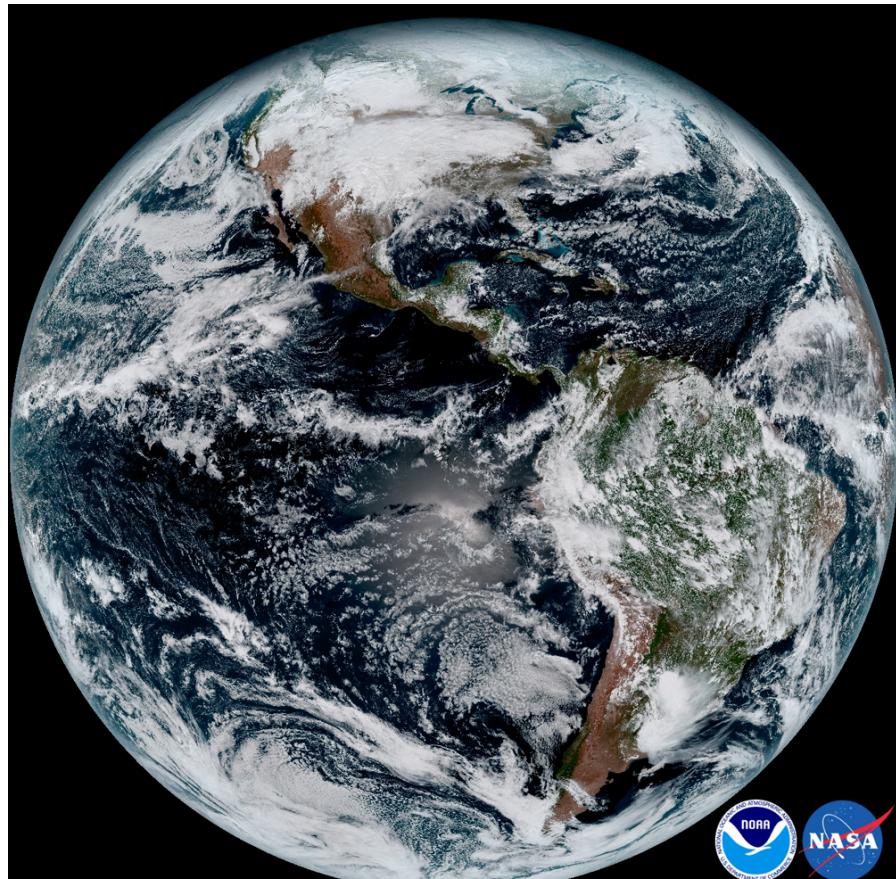
(photo credit: bbc.com)



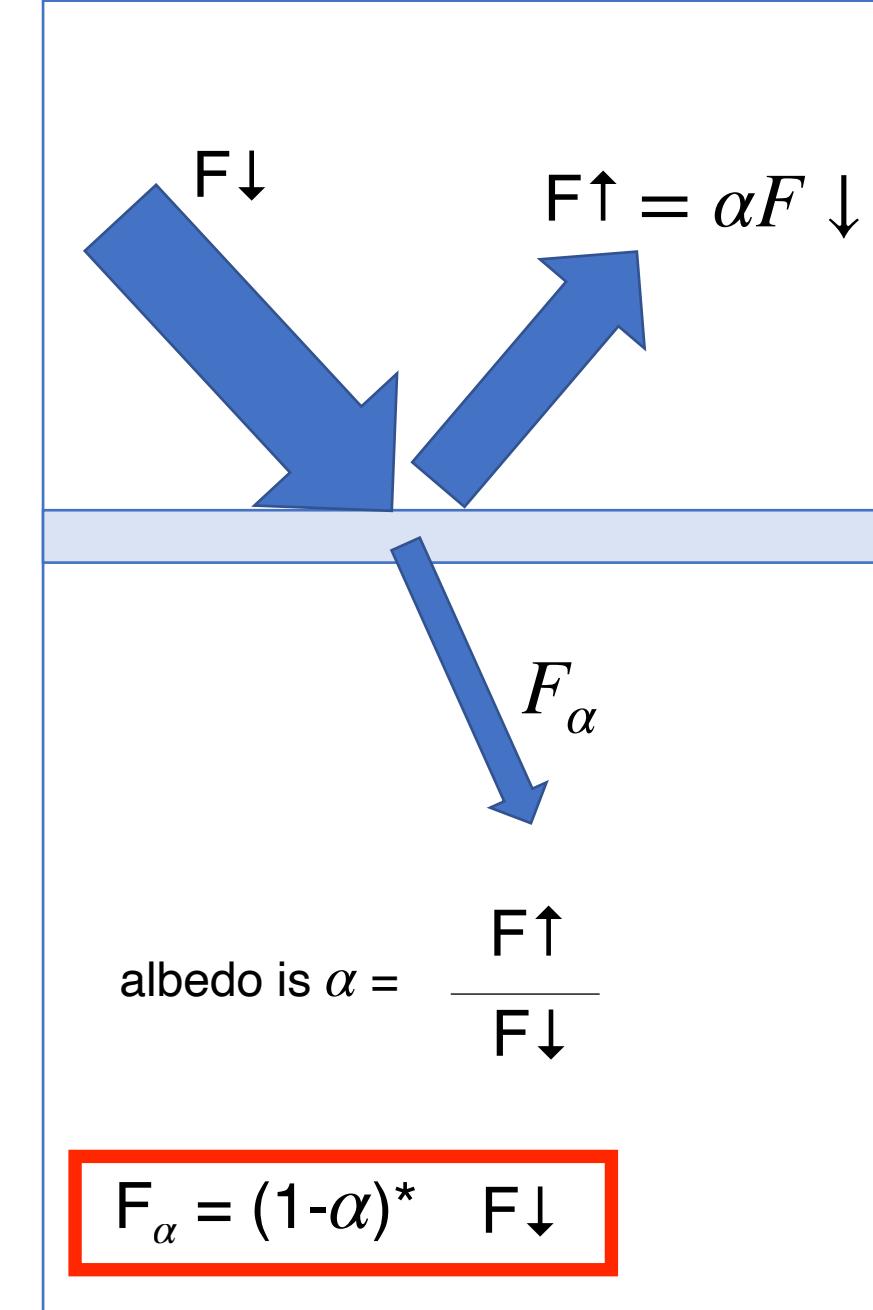
reflection of electromagnetic radiation
(visible light here)

What is Albedo?

Albedo: Ratio of reflected light to incoming light $\alpha = \frac{F \uparrow}{F \downarrow}$, $\alpha \propto [0,1]$



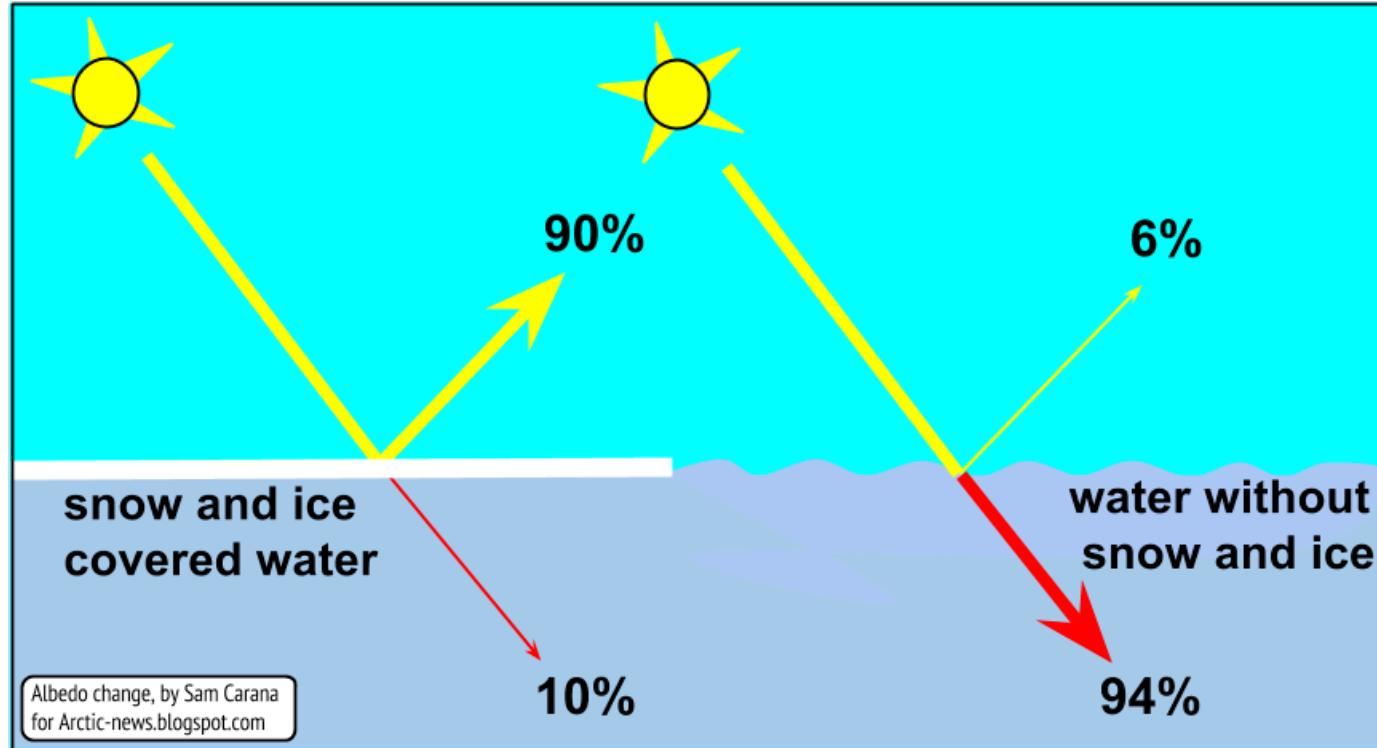
Ice, cloud and ocean,
which has a higher
albedo?



We care most: how much energy is absorbed!

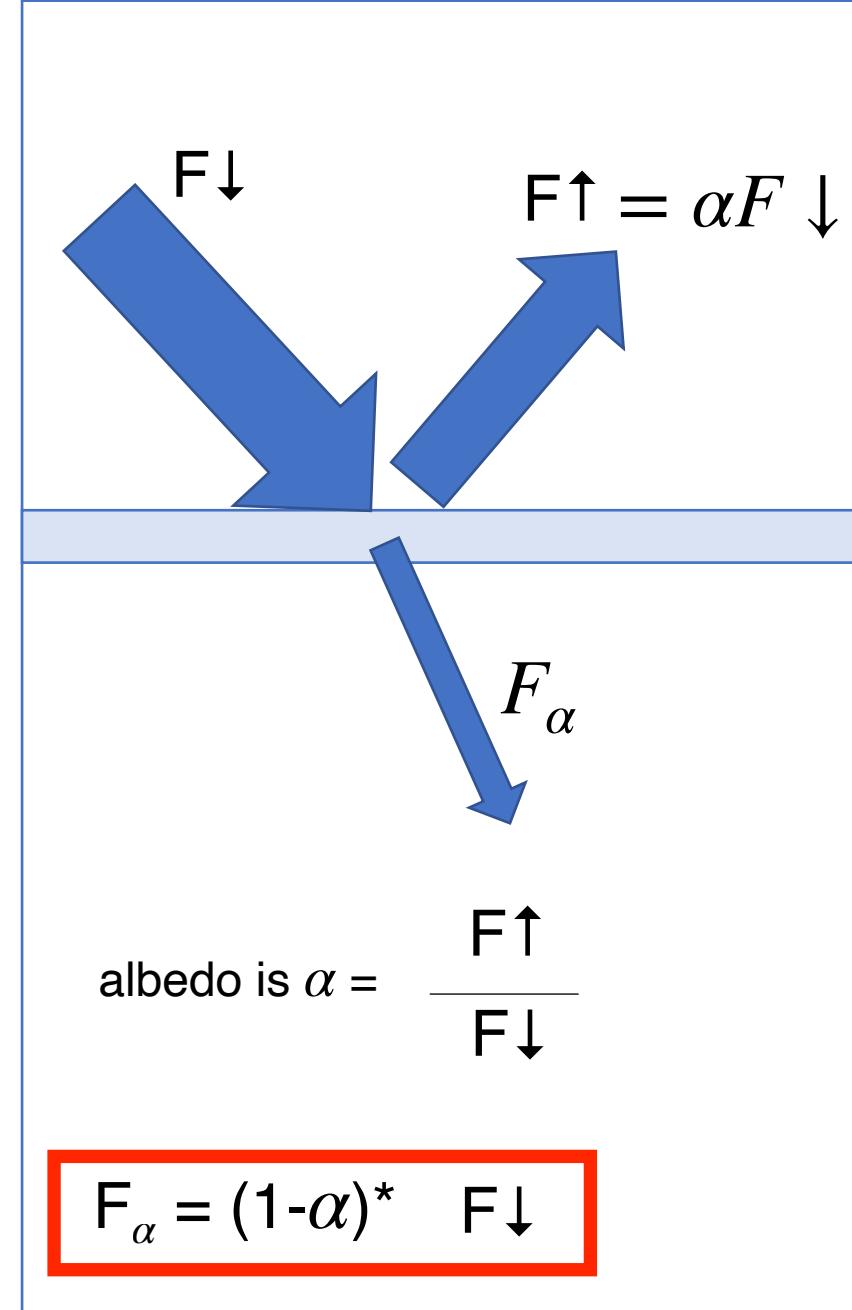
What is Albedo?

Albedo: Ratio of reflected light to incoming light $\alpha = \frac{F \uparrow}{F \downarrow}$, $\alpha \in [0,1]$



Ice/Snow: Very reflective = High albedo (appears bright)

Ocean: Very absorbing = Low albedo (appears dark)

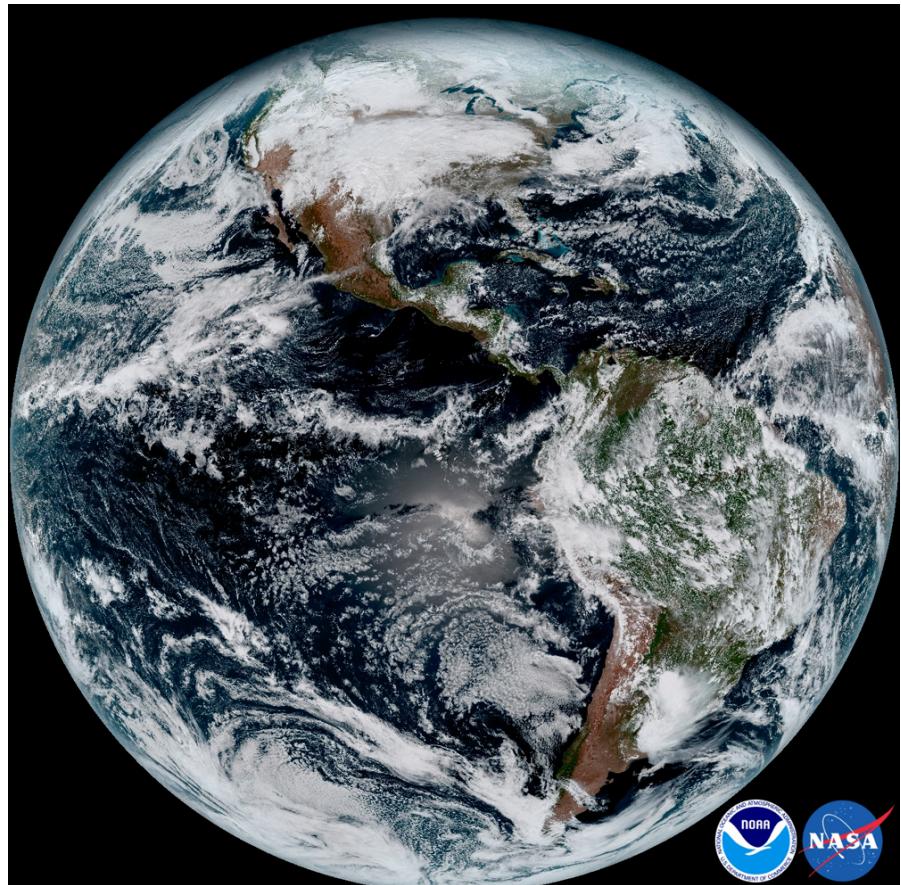


We care most: how much energy is absorbed!

Albedo and climate

Albedo commonly refers to the "**whiteness**" of a surface (0 meaning black and 1 meaning white).

$\alpha = 0$: surface is a "perfect absorber" that absorbs all incoming energy. Absorbed solar energy can be used to heat the surface or, when sea ice is present, melt the surface; $\alpha = 1$: surface is a "perfect reflector" that reflects all incoming energy.



Albedo is related to how much solar radiation (mainly in visible light) will be reflected and absorbed by Earth.

Albedo and exoplanet*



Photo credit: European Space Agency

Ocean glint can be applied in detecting oceans on exoplanet.