


Global Oceans: Source or Sink?

The ocean and atmosphere constantly strive to reach equilibrium with one another with respect to CO₂.

For more information, contact:

 @KatieSieradzan

 katie.sieradzan@bangor.ac.uk

Shelf seas with a relatively **low CO₂ content** are known as **undersaturated**. These seas act as **sinks**, absorbing CO₂ from a relatively **supersaturated** (CO₂ - rich) atmosphere.



Shelf seas with a relatively **high CO₂ content** are known as **supersaturated**. These seas act as **sources**, releasing CO₂ to a relatively **undersaturated** (CO₂ - poor) atmosphere.

But **why** are some seas **supersaturated** and others **undersaturated**?

Primary Productivity

Primary productivity (also known as 'production via photosynthesis') is the method by which **plants** and **phytoplankton** within the water get **energy**. This process requires **CO₂** and **sunlight**, so can only happen within the **top 200m** of the water column. Because this process uses CO₂, the water becomes **undersaturated**. Therefore, seas with **high productivity** tend to be **sinks**, and seas with **lower productivity** tend to be **sources**.



Temperature

Water has the ability to contain **dissolved CO₂**. This is called **CO₂ solubility**. Warmer water has a **lower CO₂ solubility**, meaning it can contain less CO₂. Therefore, the water **reaches saturation** quickly. Colder water has a much **higher CO₂ solubility**, so more CO₂ can be dissolved before the water becomes fully saturated.



The map simplifies the relative **temperature** at the **sea surface**, and thus shows which areas have a relatively high CO₂ solubility.

Upwelling

Upwelling is the process by which **cold, nutrient-rich** deep water is brought to the surface. If this upwelling is **seasonal**, the nutrients can be **utilised efficiently** by the biology in the water. The area acts as a **sink**. If the upwelling is **permanent**, too many nutrients are brought to the surface, and they can not be utilised effectively. Therefore, the area acts as a **source**.

