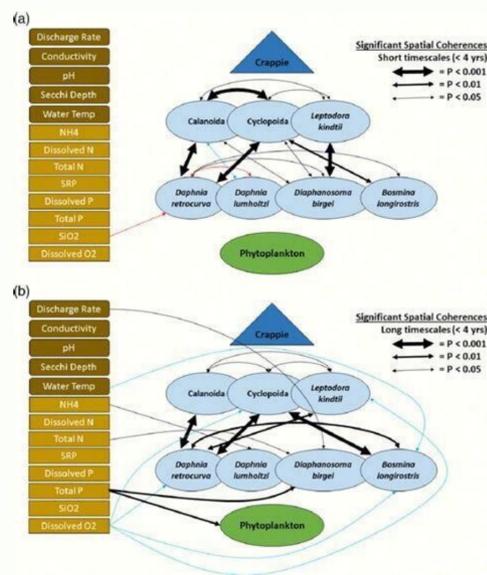


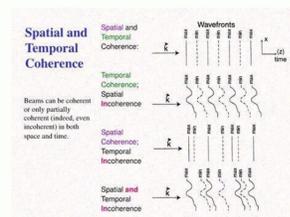
I'm not robot  reCAPTCHA

I am not robot!

What is temporal and spatial coherence. Distinguish between spatial and temporal coherence. What is the difference between temporal and spatial. Difference between spatial and temporal coherence.



There are various ways of quantifying the degree of coherence, as described below. It is also common to call certain processes or techniques coherent or incoherent. In that case, “coherent” essentially means phase-sensitive. For example, the general method of coherent beam combining relies on the mutual coherence of beams, whereas spectral (incoherent) beam combining does not. **Spatial Versus Temporal Coherence Figure 1:** A prism is inserted into a spatially coherent laser beam, generating an interference pattern on the screen. There are two very different aspects of coherence: Spatial coherence means a strong correlation (fixed phase relationship) between the electric fields at different locations across the beam profile. For example, within a cross-section of a beam from a laser with diffraction-limited beam quality, the electric fields at different positions oscillate in a totally correlated way, even if the temporal structure is complicated by a superposition of different frequency components. Spatial coherence is the essential prerequisite of the strong directionality of laser beams. Temporal coherence means a strong correlation between the electric fields at one location but different times. For example, the output of a single-frequency laser can exhibit a very high temporal coherence, as the electric field temporally evolves in a highly predictable fashion: it exhibits a clean sinusoidal oscillation over extended periods of time. Figures 2–4 further illustrate the difference between spatial and temporal coherence. For reference, Figure 2 shows a monochromatic Gaussian beam, exhibiting perfect spatial and temporal coherence. **Figure 2:** Electric field distribution around the focus of a Gaussian laser beam (coming e.g. from the left side) with perfect spatial and temporal coherence. **Figure 3** shows a beam with high spatial coherence, but poor temporal coherence. The wavefronts are formed as above, and the beam quality is still very high, but the amplitude and phase of the beam varies along the propagation direction. Note that both the local amplitude and the spacing of the wavefronts vary to some extent. Such a beam can be generated e.g. from the output of a supercontinuum source. **Figure 3:** A laser beam with high spatial coherence, but poor temporal coherence.



Difference between spatial and temporal coherence. Spatial coherence vs temporal coherence.

