



Spring-neap pulses of primary production in the seasonal shelf sea thermocline.

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During summer a layer of phytoplankton is almost always found within the shelf sea thermocline, growing in response to the weak sunlight reaching down from the sea surface and the weak flux of nutrients into the thermocline mixed from the bottom water. Tidally-generated turbulence plays an important role in determining the position of the thermocline, and recent observations have shown how this turbulence can erode the base of the thermocline and mix phytoplankton down into the bottom water. We place these observations within the context of the spring-neap cycle, using a coupled turbulence-primary production model. Erosion of the base of the thermocline and the layer of phytoplankton is shown to occur as tides increase from neaps to springs. After spring tides the decreasing mixing allows the thermocline to reach deeper again, trapping bottom layer nutrients and fuelling a brief pulse of phytoplankton production. The consequences of this process for shelf sea primary production and the supply of organic material to the bottom water are quantified, and potential impacts on the phytoplankton community are suggested.