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Impact of tides on primary production in the North Sea

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The North Sea is an area of high biological productivity. In part this is due to the large amounts of nutrients carried by rivers entering the North Sea. Since the North Sea is quite shallow, wind and tides are very efficient at renewing the nutrients in the euphotic zone, and are important for the high productivity. For many hydrodynamic applications, tides can be assumed to be constant, or the contributions from the tides can be assumed to average to zero. However, in a shallow region like the North Sea, tides have to be taken into consideration when estimating lower trophic level productivity numerically with coupled physical-biological models.
The impact of tidal variations on the primary and secondary production in the North Sea has been investigated by the use of the 3-D coupled physical-biological ocean model ECOSMO(ECOSystem MOdel). The model has been integrated from 1980 to 2003. M2 being the the dominant tidal component in the North Sea, the trivial comparison of no tidal forcing versus M2-forcing reveals a significant increase in production. Moreover, it was found that variations in the timing of the spring-neap cycle and long-term variations of M2 due to long periodic tidal influences have a significant impact on biological productivity. The British North Sea coast appeared particular sensitive.