Process and conditions of formation of *Karenia mikimotoi* bloom in Bohai Sea, China

Ruixiang Li¹, Mingyuan Zhu¹ and Jianqiang Yang²

- 1 First Institute of Oceanography, SOA
- 2 Environment Monitoring Centre of North China Sea, SOA

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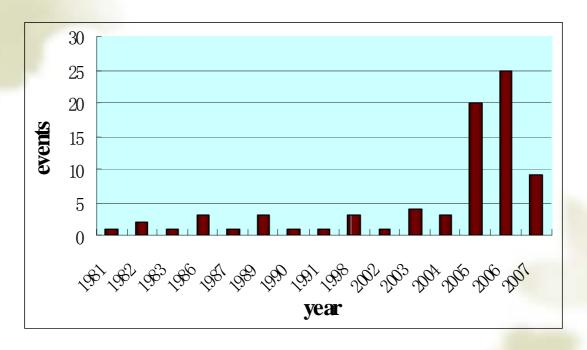
- ► General status of *Karenia mikimotoi* bloom in China Seas
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► General status of Karenia mikimotoi bloom in China Seas

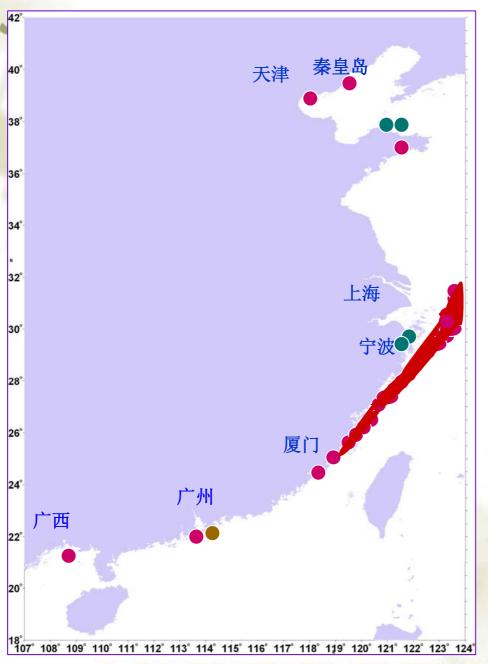
Karenia mikimotoi is a eurytopic species. It forms Harmful Algal Blooms in many coastal countries in the world and causes great concern in these countries.

In China the bloom of *Karenia mikimotoi* occurs mainly in Estuary of Pearl River in South China Sea, Estuary of Yangtze River in East China Sea as well as coastal water of Tianjin City. However, there is no record of *Karenia mikimotoi* bloom in Yellow Sea so far, but there was one record in shrimp pond in Rongcheng county, Shangdong Province.

The occurring frequency of *Karenia* mikimotoi bloom in China Sea



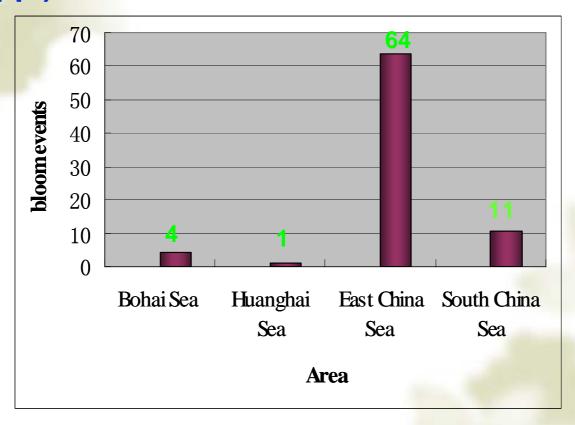
2003 years ago, bloom events of *karenia mikimotoi* was less,but since 2004 occurring frequency tend to increase observably, especially 2005 and 2006.



Distribution of bloom of *Karenia mikimotoi*

- Karenia mikimotoi and Gymnodinium sp.
- Akashiwo sanguineum
- Cochlodinium polykrikoides

Statistic of *Karenia* (including Gymnodinidium spp.)bloom in different sea waters

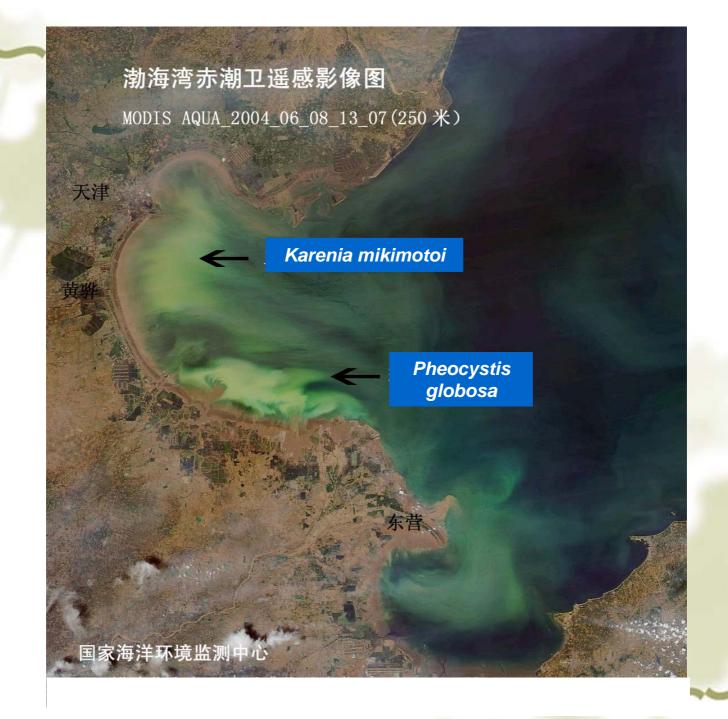


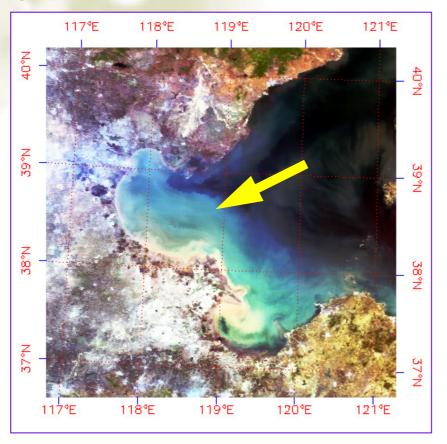
The bloom events of *Karenia* in East China Sea occupied 81% of total blooms of *Karenia* in China Sea

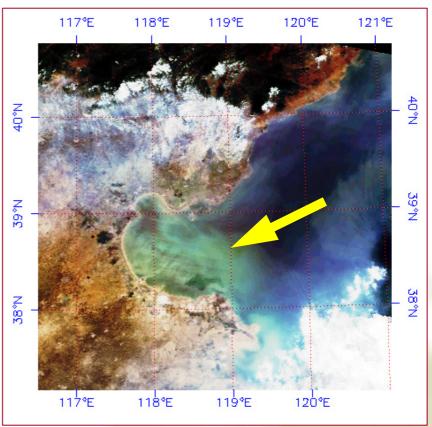
► Process and conditions of formation of *Karenia mikimotoi* bloom in Bohai Sea ,2004

Several HAB in Bohai Bay in 2004

HAB species	Time/date	
Ditylum brightwellii	16/05/2004	
Skeletonema costatus	31/05/2004	
Karenia mikimotoi	03/06/2004~18/06/2004	
Mesodinium rublum	21/06/2004	
Odontella sinensis and Dinophysis acuminata	01/07/2004	
Chattonella mirina	05/07/2004~08/07/2004	





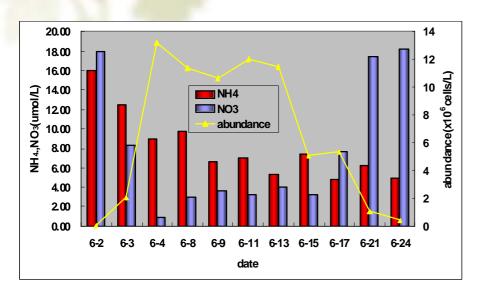


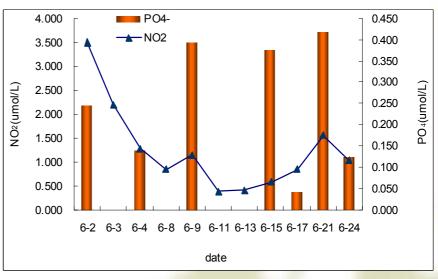
18/05/2005 MODIS image

30/05/2005 MODIS image

This HAB was mainly Thalassiosira and karenia mikimotoi

The change of nutrients and *Karenia* mikimotoi abundance in process of bloom

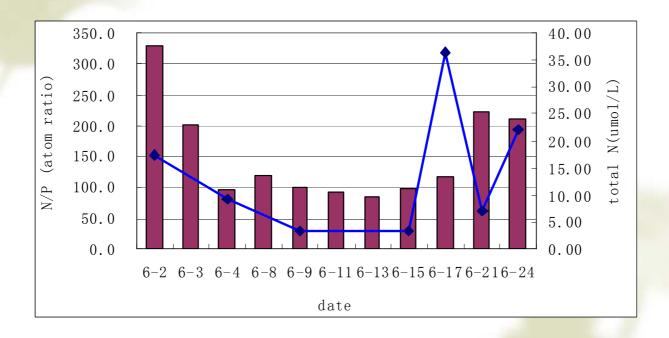




The change of nitrate, ammonium and abundance of k.mikimotoi

The change of nitrite and phosphate

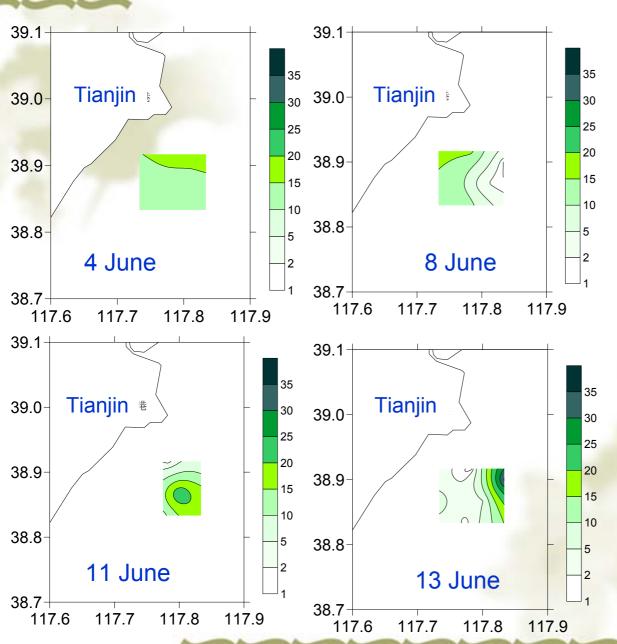
The variation of atom ratio of N/P during *Karenia mikimotoi* bloom



At beginning of *Karenia mikimotoi* bloom, the ratio of N and P was about 153. As the boom was developing, the ratio decreased to less than 30. when the bloom of *karenia* disappeared, N/P increased to more than 300.

meteorological condition during bloom of *K. mikimotoi*

parameter	02June	09June
Air temperature (°C)	24.4	29.8
Water temperature	21	24
Wind speed (m/s)	2-3(mean)	
Air pressure (hpa)	10170(mean)	



The distribution and variation of abundance of *k.mikimotoi*

Unit:x106cells/L



- **♦** *Karenia mikimotoi* bloom occured in Tianjin coast waters on 3 June, 2004. The area is about 300 km². This bloom lasted for half a month, causing losses of mariculture of shrimp.
- ◆ Faverable weather condition, especially continuous sunshine, is one of causes to this bloom. *Karenia mikimotoi* were blooming with fast-increasing water temperature and extinction with nutrients depletion.
- ◆ During the extinction process of *Karenia mikimotoi* bloom, ammonium rapidly increase. This would provide again the abundant material foundation for the next bloom. For example, *Mesodinium rublum* bloom (June 21) and *Chattonella mirina* bloom (July 5-8) occurring follow the *Karenia mikimotoi* bloom.

Thanks for your attention!