近海海洋环境科学国家重点实验室（厦门大学）

State Key Laboratory of Marine Environmental Science (Xiamen University)

Can we provide a reliable report with a limited data set ?

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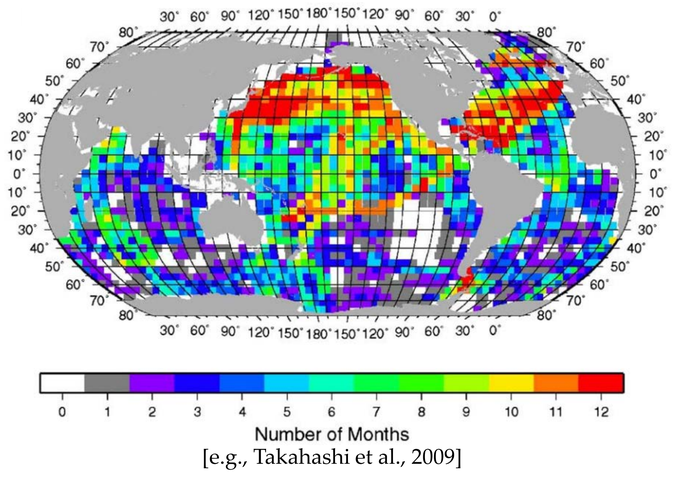
Introduction

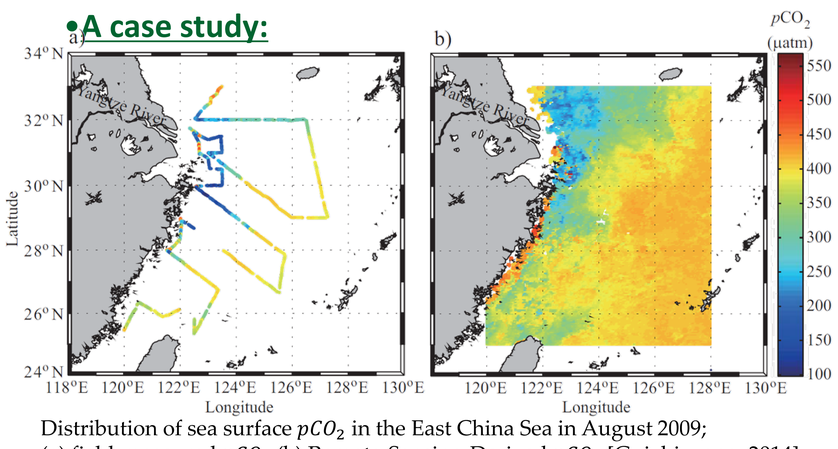
•'Nothing puzzles me more than time and space; and yet troubles me less…' - *Charles Lamb (1810)*



[e.g., Takahashi et al., 2009]

•In the physical world, a lot of research reports can not be efficiently comparing due to insufficient data sources. Therefore, in order to deal with this problem, we designed a standard protocol to quantify uncertainty of different field study.

•A case study:



Distribution of sea surface pCO_2 in the East China Sea in August 2009;
(a) field-measured pCO_2 (b) Remote-Sensing-Derived pCO_2.[Guizhi wang, 2014]

- Analytical Error (Em)
- Spatial Variance → $\sigma_T = \sqrt{E_m^2 + \sigma_s^2 + \sigma_u^2}$
- The bias from undersampling

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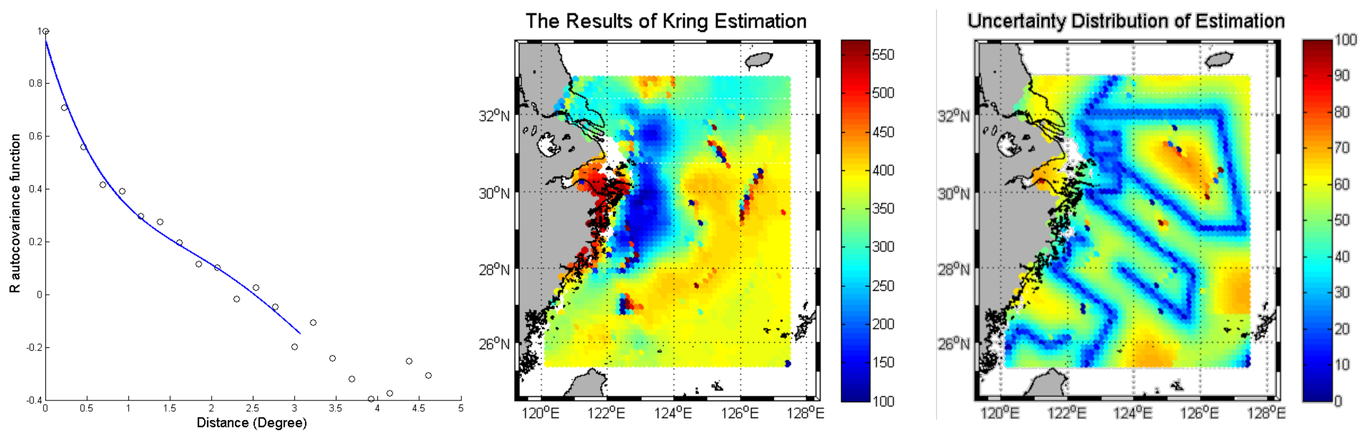
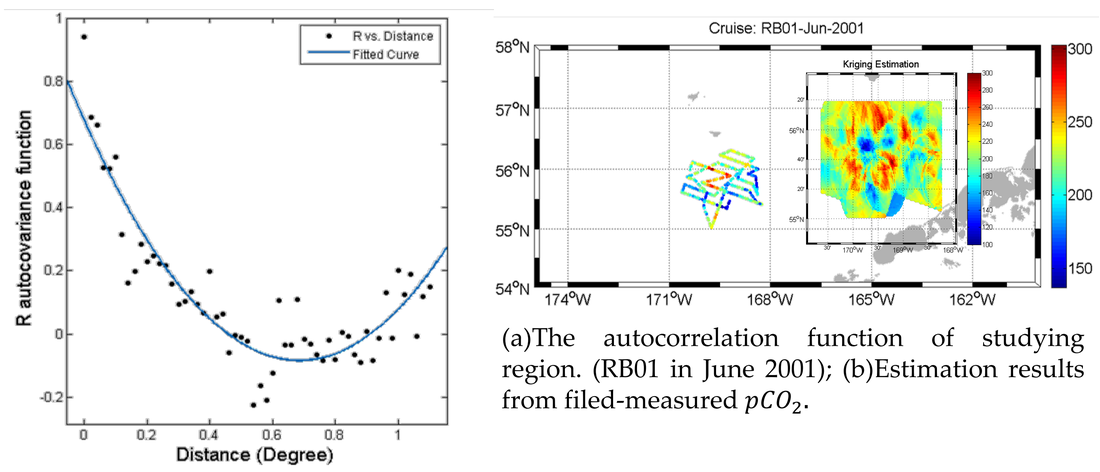
Results

Basing spatial analysis and combining the advanced remote-sensing-derived data and simultaneous field-measured pCO2 data, to build an autocorrelation function for the estimation.

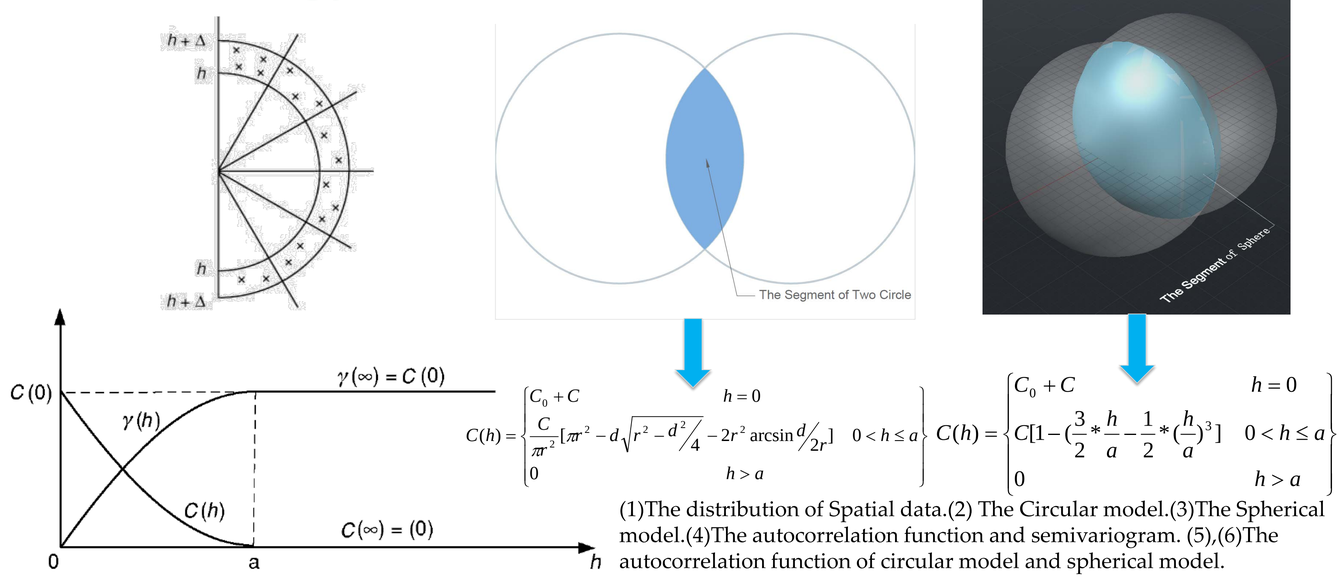


(a)The autocorrelation function of studying region. (East China Sea in August 2009);
(b)Estimation results from filed-measured pCO_2; (c)Uncertainty report with estimation.



(a)The autocorrelation function of studying region. (RB01 in June 2001); (b)Estimation results from filed-measured pCO_2.

Methodology - Kriging Estimation



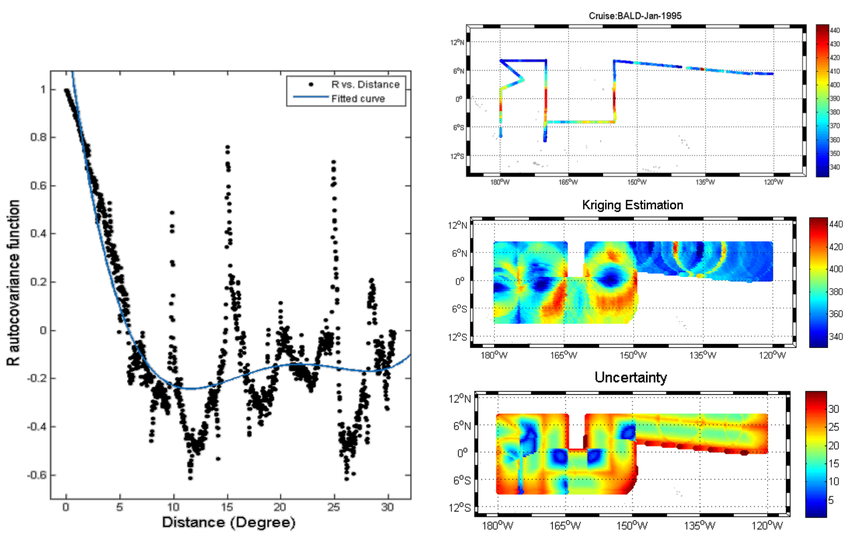
$$C(h) = \begin{cases} C_0 + C & h = 0 \\ \frac{C}{\pi r^2}\left[\pi r^2 - d\sqrt{r^2 - d^2/4} - 2r^2 \arcsin d/2r\right] & 0 < h \le a \\ 0 & h > a \end{cases} \qquad C(h) = \begin{cases} C_0 + C & h = 0 \\ C\left[1 - \left(\frac{3}{2} * \frac{h}{a} - \frac{1}{2} * \left(\frac{h}{a}\right)^3\right)\right] & 0 < h \le a \\ 0 & h > a \end{cases}$$

(1)The distribution of Spatial data.(2) The Circular model.(3)The Spherical model.(4)The autocorrelation function and semivariogram. (5),(6)The autocorrelation function of circular model and spherical model.

Conclusions

Comparing to current many studies, this method can provide an quantitative uncertainty report with a high resolution. Considering its potential wide application in the future, I wrote an program in MATLAB platform to make it output uncertainty report automatically.

However……



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