Inverse estimates of the air-sea flux of carbon using surface pCO_2 measurements

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A new method of estimating the historical pCO_2 at the sea-surface is used to estimate the air-sea CO_2 flux and the time rate of change of ΔpCO_2 from 1980 through 2010. Using a large surface pCO_2 measurement database [1], which despite its size sparsely represents much of the ocean over the past 40 years, we find optimal estimates of the pCO_2 using information from global circulation models and a simplified model of pCO_2 in the surface water. The simplified model describes the time evolution of surface pCO_2 on a 5x4 ° grid according to

$$pCO_2(t) = At + B + C \cdot pCO_2'(t).$$

The third term, pCO_2' (t), represents the interannually-varying seasonal cycle and other interannual variations in pCO_2 diagnosed from a series of simulations using the GFDL MOM4.1 ocean general circulation model and the BLING biogeochemistry model (OGCM). For each grid box, we estimate the model parameters A, B and C by evaluating likelihood against the data using a bayesian markov chain monte carlo technique (MCMC) [2].

The resulting pCO_2 trends and diagnosed fluxes are provocative. The method indicates an ocean sink for anthropogenic carbon of 2.7 ±.15 Pg C for the year 2000. The estimated annual rate of change of the ΔpCO_2, used as an indicator of flux trends, shows where the ocean is changing at a rate significantly different than the atmosphere. The implied air-sea carbon flux is increasing over much of the ocean, with exceptions in the Northern Atlantic and Pacific basins.

Projections and hindcasts of the ocean carbon sink that are based on OGCM simulations rely on the response of the OGCM to climate change. The framework proposed here allows us to evaluate that modeled response, of the carbon cycle to climate change, against the observations. We present regional analysis indicating whether or not modeled trends and feedbacks are occuring in the real earth system.

[1] Takahashi *et al*. (2010) ORNL/CDIAC-152, NDP 088
[2] Hastings, W. K. (1970) *Biometrika* **57**(1), 97–109.

Using discrimination analysis for anomaly separation and distinguish the mineralized factors

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Distinguish the mineralized factors in anomaly data

In the current research, the abilities of the discriminant analysis in distinguishing anomaly from background [1, 2, 3] for soil lithogeochemical samples in porphyry Cu-Au- Dalli area (Iran) was shown. A group of 163 samples with sample space of 50*50 m^2 were used. According to the results (Fig. 1), three populations were separated in data set (Fig. 1a). The second group (code 2) is related to the anomalous sub-population, the first group (code 1) is considered as mixture of background and anomalous sub-population and the zero group (code 0) is shown the background sub-population. In the anomalous sub-population, the elements of Au and Cu (Fig. 1b) are introduced as mineralized factors, the elements of V, Fe, P, Y, Ba, and Sc are important in the mixed sub-population.

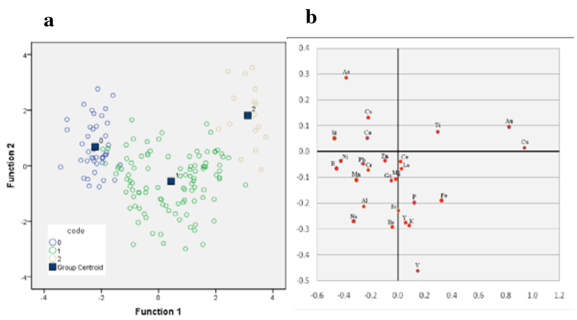

Figure 1: Discrimination analysis, anomly separation (a) and mineralized factor (b).

Conclusion

One of the charactristic of the discrimination analysis as anomaly separation method in compare with the other methods is the identification of the mineralized factors or elements.

[1] Davis, J.C. (2002) John Wiley & Sons, 646 pp. [2] Peh, Z. & Halamić, J (2010) *J. Geo. Expl*. **107**, 30–38.
[3] www.statsoft.com/textbook/stathome.html.