Biogeosciences Discuss., 8, C1510–C1513, 2011
www.biogeosciences-discuss.net/8/C1510/2011/

Biogeosciences Discussions

Interactive comment on "Quantifying in-situ gas hydrates at active seep sites in the eastern Black Sea using pressure coring technique" *by* K. Heeschen et al.

Anonymous Referee #1

Received and published: 13 June 2011

General Comments

I believe the primary messages of the paper are 1) to provide information on GH occurrence very near the seafloor at some specific sites in the Eastern Black Sea, 2) to indicate a more universal message that one can get better and more detailed information on the distribution and saturation of GH when pressure core data are integrated with detailed pore-water sampling, and 3) that comparing these datasets allows corrections to the pore-water derived saturation estimates by providing information to support deviation from the typical default linear baseline pore-water chemistry assumptions. Assuming this is a fair reading of the goals of the paper, I feel that goal #1 is achieved.

Per #2, this is difficult as every GH site is different, but I think the authors are clear that this study is specific to shallow seep sediments. For #3, I think the paper makes a worthwhile case study to document this point.

Specific Comments

4530-8: Can you call this an "upper gas hydrate stability boundary"? Wouldn't gas hydrate theoretically be stable above this, but is not present due to lack of methane supply (so instead an upper boundary of the "gas hydrate occurrence zone" as some have called it).

4530-25: It is not clear if you are talking about uncertainties in inventorying GH at a specific site or over broad regions (Milkov addresses global issues). The problems are very different and I recommend you focus on the site evaluation issues which are significant even where extensive in situ data are available (particularly when the saturations are low or when the occurrence is highly heterogeneous as is very common in high flux marine-clay dominated sites where grain-displacing forms are common). Both these situations place great uncertainties on saturation estimation even given advanced log data suites and dense pore water sampling and commonly evaluation of pressure core data has been taken as a standard tool against which to calibrate measures inferred from other data sets.

Schultheiss, P., Holland, M., Humphrey, G., 2009. Wireline coring and analysis under pressure: recent use and future developments of the HYACINTH system; Scientific Drilling 7, 44-47. (for example).

4536-11: This paragraph tends to imply that the only data set that can provide vertical (intra-core)resolution is chlorinity. Elsewhere, pressure cores have been analyzed via X-ray CT and various other physical property measures (resisitivity, acoustic velocity) to provide distribution/morphology information. I understand that that is not available in this case, but perhaps should be noted...

4537-26: Echo here Jerry Dickens' eralier posted comment that time-series plots of gas collection during degassing would support this discussion.

4539-1: It is difficult to just describe features in seismic and have the reader understand. I think it is better to either show the data or delete the verbal descriptions. I do not know what a "structure-wide feeder channel" is, for example.

4539-14: These are gas compositions of collected gases.. can you call them "gas hydrate compositions"?

4539-23: I think the highest values worldwide comment is a bit problematic. I can assume the pv% is a function of scale, with very large numbers being more common at smaller scales? Perhaps just delete the "...exceeding average known values". (it is also a bit iffy to compare your sites' "Maximum" to other sites' "Averages". Also, the comment on further work to see if this is very local or more regional... how does the comment re Core BS371AP at 4536-2 figures in?

4556: As core BS351AP is the subject of much focus, it would perhaps be useful to present other data from core samples, such as mineralogy, grain size, etc., to see if there is any other information relevant to the 85 to 205 cmbsf anomaly.

Technical Corrections

4530-24: Should be Milkov, A., 2004. Earth Science Reviews 66 183-197.

4531-25: Do sediments have salinity?

4531-27: Is frequent (time connotation) what is intended?

4533-2 & 11: ...(see Heeschen et al., 2007).

4533-16: The sentence "To calculate..." is difficult to follow.

4534-15: The sentence "The core depths..." is difficult to follow. I think it may need to be broken into a couple sentences.

4535-5-10: The opening talks about concentrations, but the rest of the paragraph is about volumes: these should be consistent.

4535-24: "...is inferred to be bound in gas hydrate." or was this confirmed some other way?

4536-19: suggest delete "and use respective advantages"

4537-9: "beyond" is not clear... is that "other than"? is the 12% gas or gas hydrate?

4537-10: ...nearly all the gas hydrate in the core occurred between 85 and 205 cm".(note: should this be cmbsf)?

4536-26: suggest change "is clearly able to" to "can"

4538-18: delete the comma

Interactive comment on Biogeosciences Discuss., 8, 4529, 2011.