Analysis of some data from microstructure database

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Contents

1   Overview

Analysis of some global microstructure datasets, to compare the results to my EQ14 analysis. Specifically I am looking at γ and the ratio of ϵ_χ/ϵ, where γ is the mixing efficiency (more accurately mixing coefficient?) and ϵ_χ is computed as

$$\epsilon_\chi = \frac{N^2\chi}{2\gamma T_z^2} \tag{1}$$

, in the framework of trying to estime ϵ from thermistor profiles.

2   Data

- Data are from the microstructure data base at `https://microstructure.ucsd.edu/`. I am using matlab files made from the raw database files by Amy Waterhouse (shared w/ me via Google drive).

- IWISE 11 vmp data were shared with me by Lou St. Laurent.

- EQ14 data are from Jim Moum and group at OSU.

3   Code

Code and results (including figures and these notes) are available in a github repository: `https://github.com/OceanMixingGroup/Analysis/tree/master/Andy_Pickering/micro_database`

- `Plot_micro_data_AP.m`

- `Plot_hist_chieps_chi_all.m`

- `Plot_epschi_eps_2Dhist_all.m`

- `Plot_chi_eps_norm_all.m`

4   Results

4.1 Histograms of χ and ϵ

Most of the data sets contain mostly small values of ϵ (Figure 1). Graviluck and IWISE11 seem to be the only ones w/ ϵ values as large as EQ08.
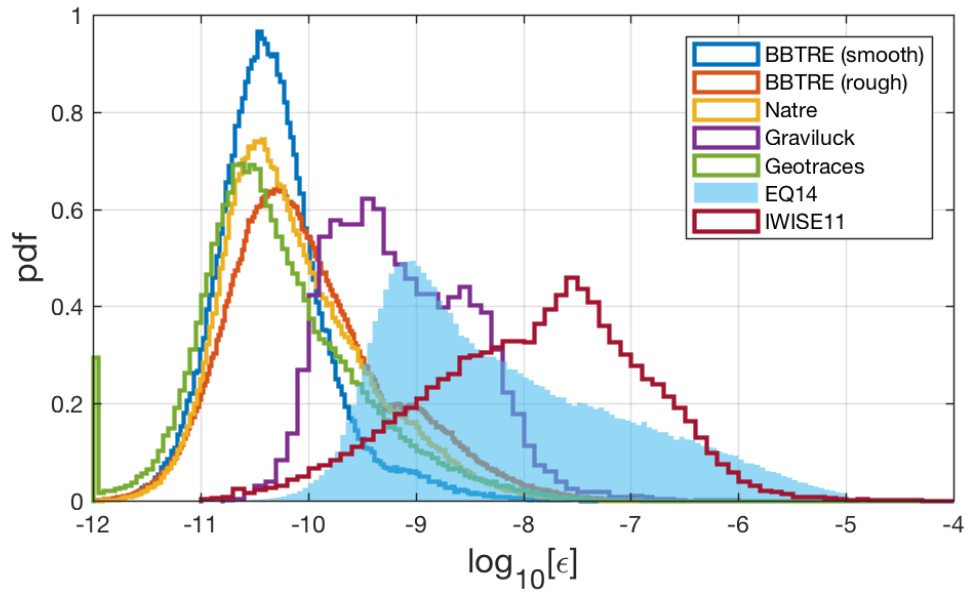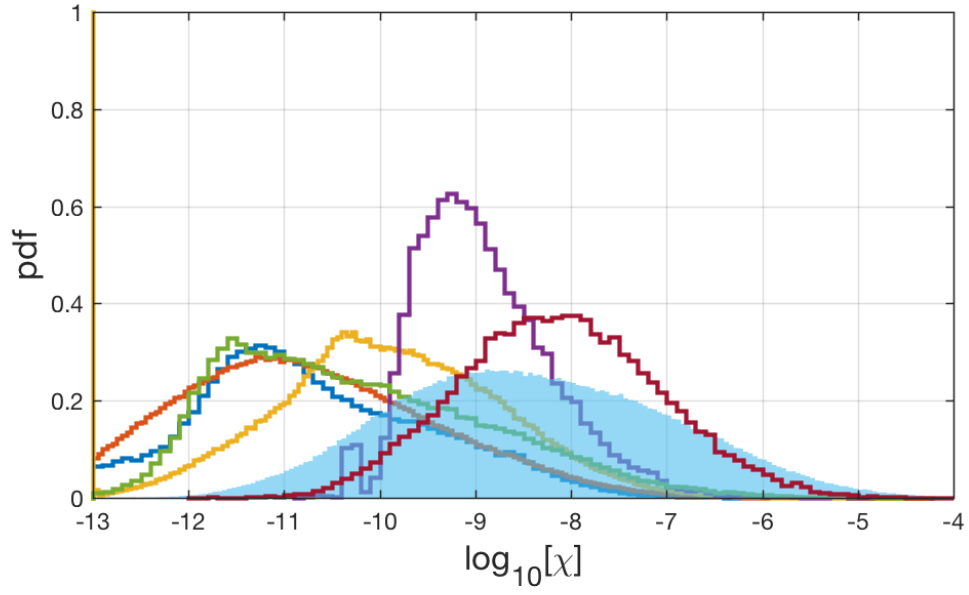
Figure 1: Histograms of (log10) χ and ϵ for different data sets.

4.2 2D Histograms of ϵ_χ vs ϵ

Figures 2 and 3 show 2D histograms of ϵ_χ vs ϵ for the various data sets. Based on Figure 2, I estimated the ϵ noise level at about $log_{10}\epsilon = -10$ (except for EQ14, which is estimated to be -8.5). Data below these noise levels are exluded in Figure 3.

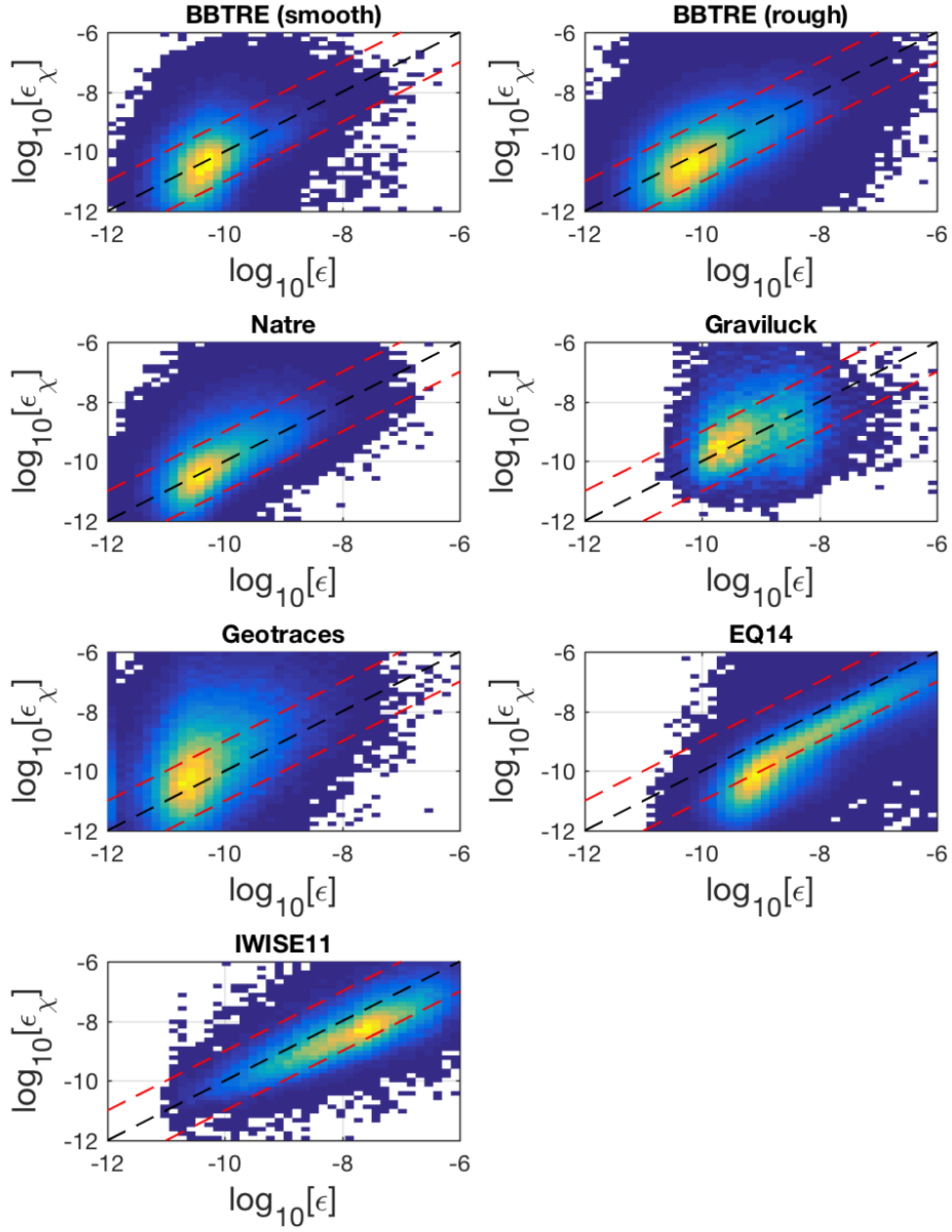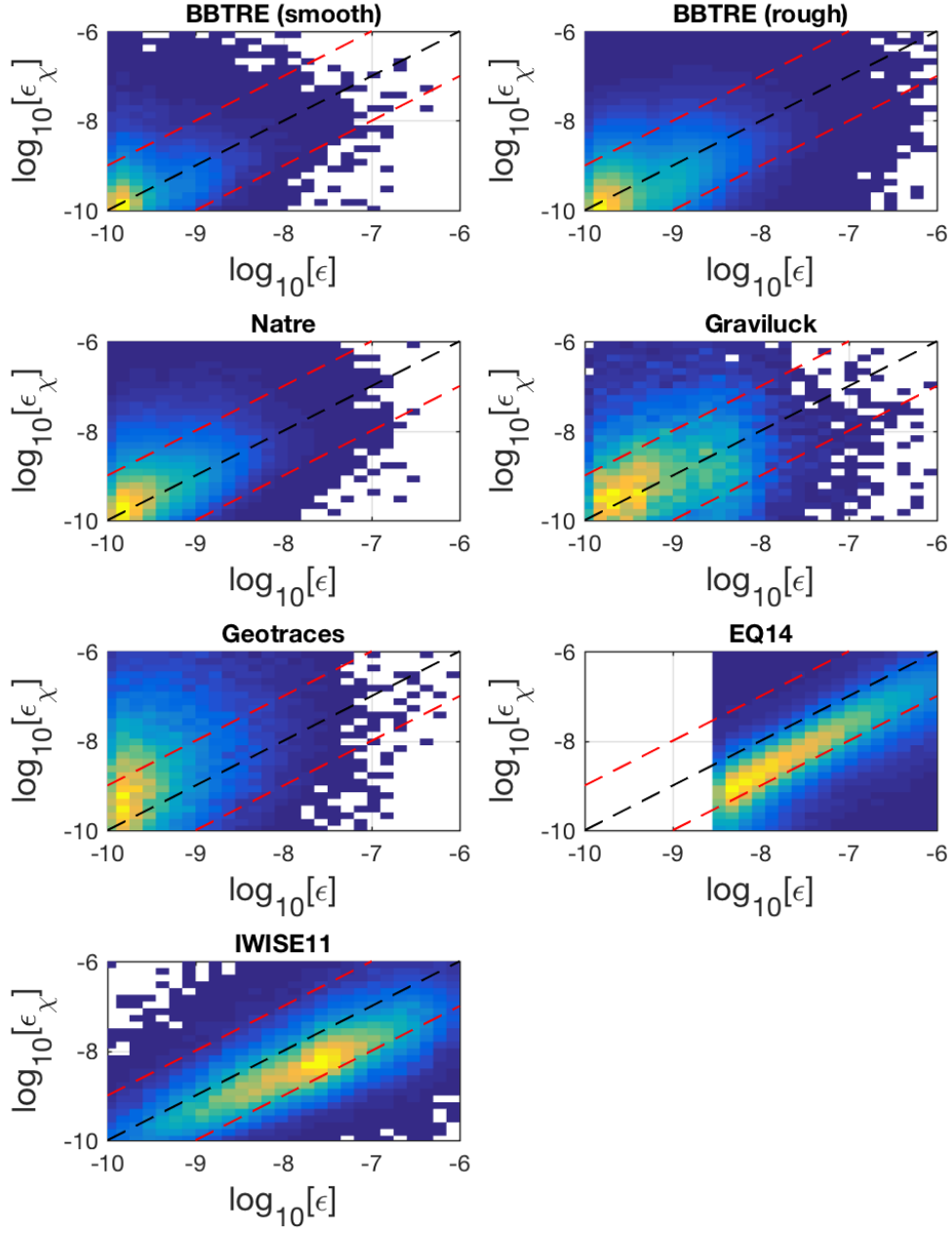Figure 2: 2D histograms of ϵ_χ vs ϵ.

Figure 3: 2D histograms of ϵ_χ vs ϵ. Values below estimated noise level of $log_{10}[\epsilon] = -10$ discarded.

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4.3 Histograms of ϵ_χ/ϵ

- EQ08 and IWISE11 are biased low. Geotraces is biased high. Most of the others are close to 0.
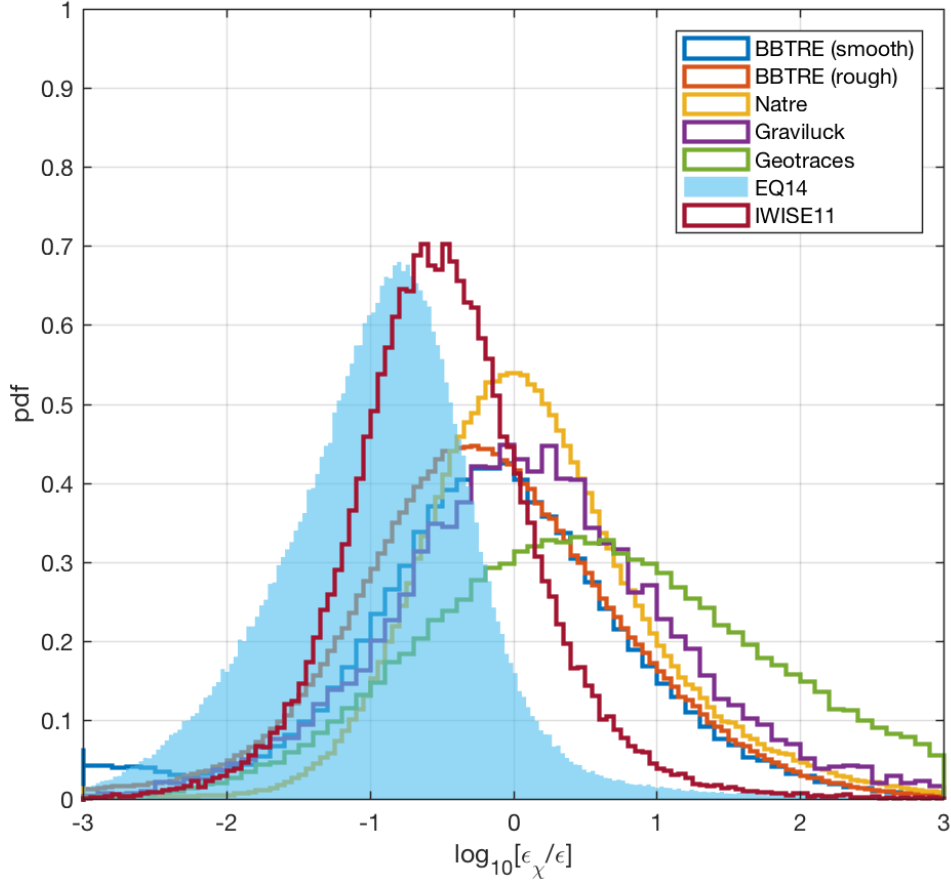
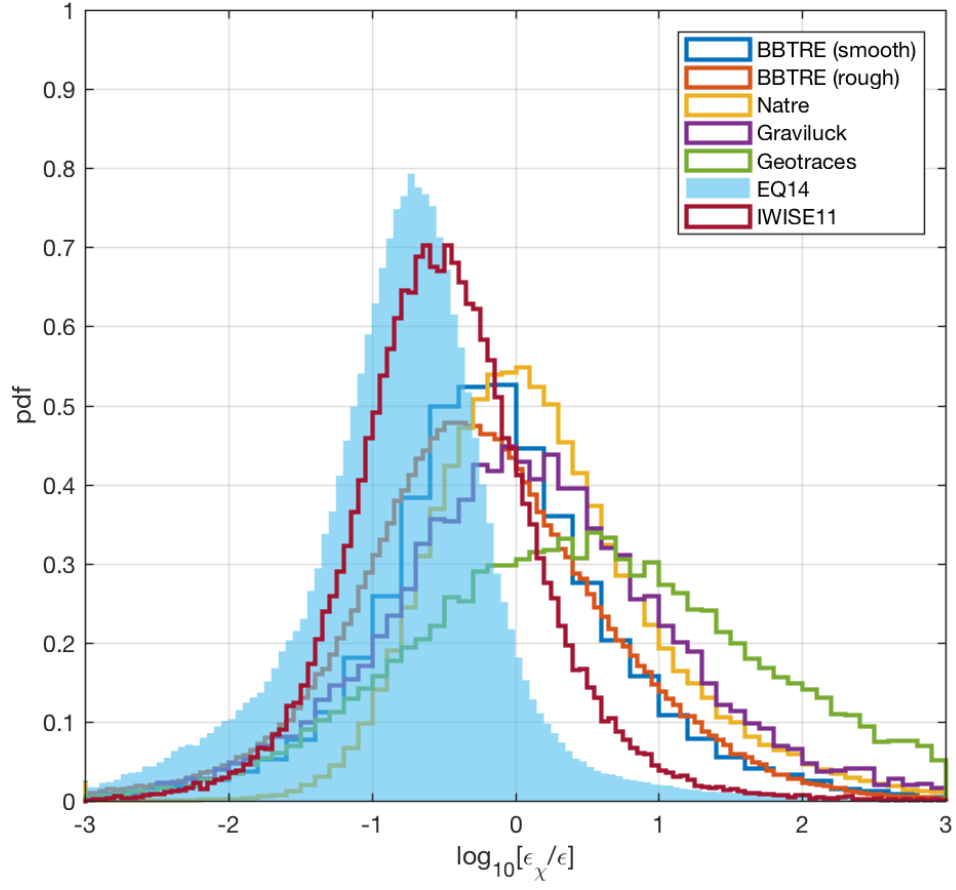Figure 4: Histograms of (log10) the ratio ϵ_χ/ϵ for different data sets.

Figure 5: Histograms of (log10) the ratio ϵ_χ/ϵ. Values below estimated noise level of $log_{10}[\epsilon] = -10$ discarded.

4.4 Plots of normalized χ vs ϵ

Figure 6: χ vs ϵ, normalized such that the slope is proportional to γ.
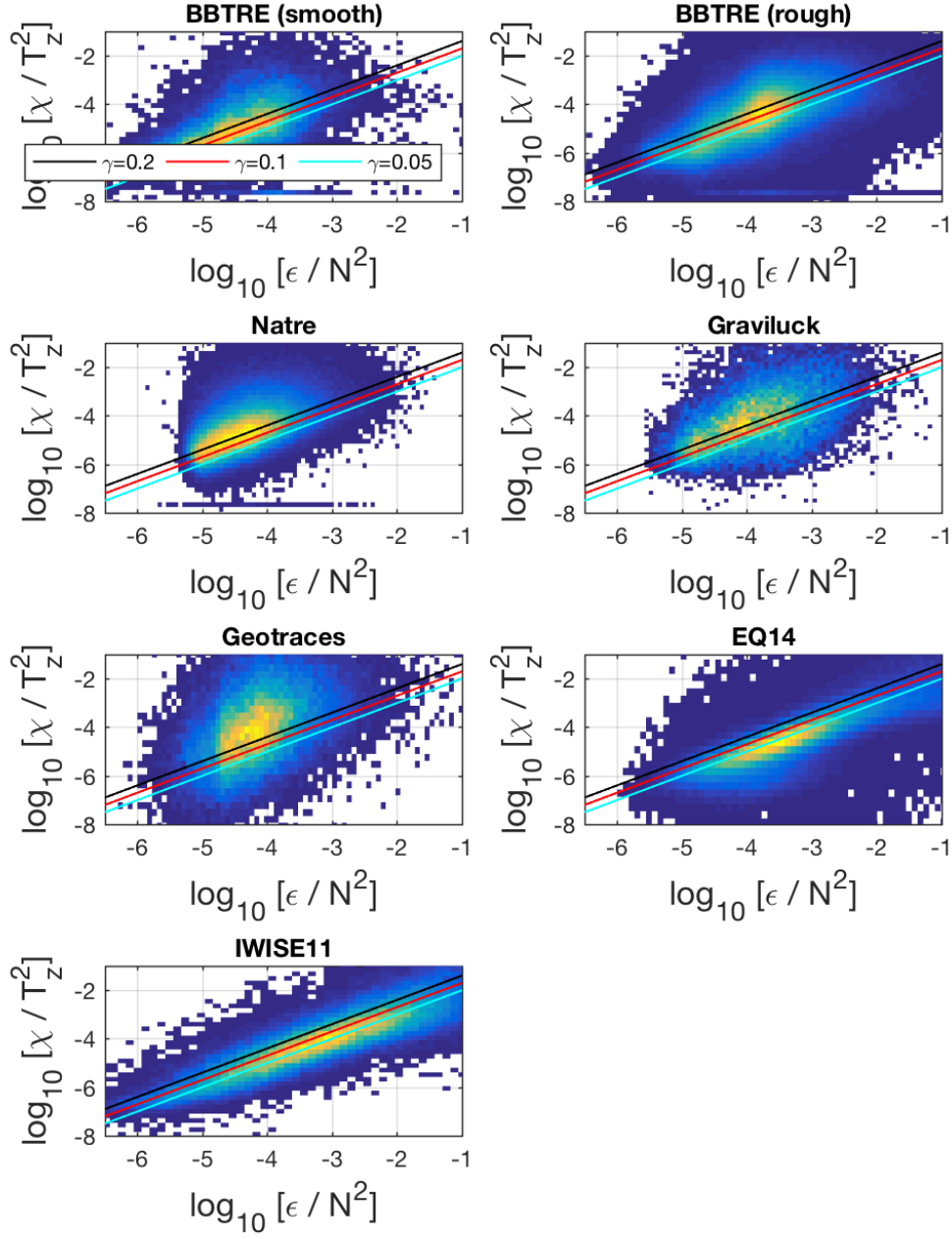
Figure 7: χ vs ϵ, normalized such that the slope is proportional to γ. Values below estimated noise level of $log_{10}[\epsilon] = -10$ discarded.