Supplementary Material: A Study of the Trade-off between Reducing Precision and Reducing Resolution for Data Analysis and Visualization

Table 1: All data sets used in experiments. The resolution of data sets is 64^3 and they are subsets of the original volumes (no downsampling performed).

Name	Type	Data type
boiler [9]	combustion simulation	float64
plasma [4]	magnetic reconnection simulation	float32
diffusivity [1]	hydrodynamics simulation	float64
pressure [1]	hydrodynamics simulation	float64
turbulence [2]	fluid dynamics simulation	float32
kingsnake [3]	scan of a snake egg	uint8
flame [5]	combustion simulation	float32
csafe	fluid dynamics simulation	uint8
enzo v [7]	cosmology simulation	float32
brain	microscope image of a marmoset brain	uint8
foam [6]	CT scan of an aluminum foam	uint16
vismale	CT scan of a human	uint8
karfs [8]	combustion simulation	float32
aneurysm	scan of brain aneurysm	uint8
velocity z [1]	hydrodynamics simulation	float64

1 Acknowledgement

We thank all the researchers who kindly shared with us their data sets to use for experiments in this paper. In particular, Benjamin Isaac provides the *boiler* and Kristoffer Matheson and Ashley Spear provides the *foam* data sets. Hong Im and Paul Arias provide *flame* [5]. The *karfs* [8] data set is kindly shared with us by Hong Im, Francisco Hernandez Perez, Ramanan Sankaran and Bok Jik Lee. We also thank Frederick Federer and Alessandra Angelucci for the *brain* data set. *csafe* is courtesy of the Center for the Simulation of Accidental Fires and Explosions (CSAFE) at the Scientific Computing and Imaging Institute (SCI), University of Utah. *vismale* is courtesy of the U.S. National Library of Medicine. Finally, the *aneurysm* data set is courtesy of Philips Research, Hamburg, Germany.

References

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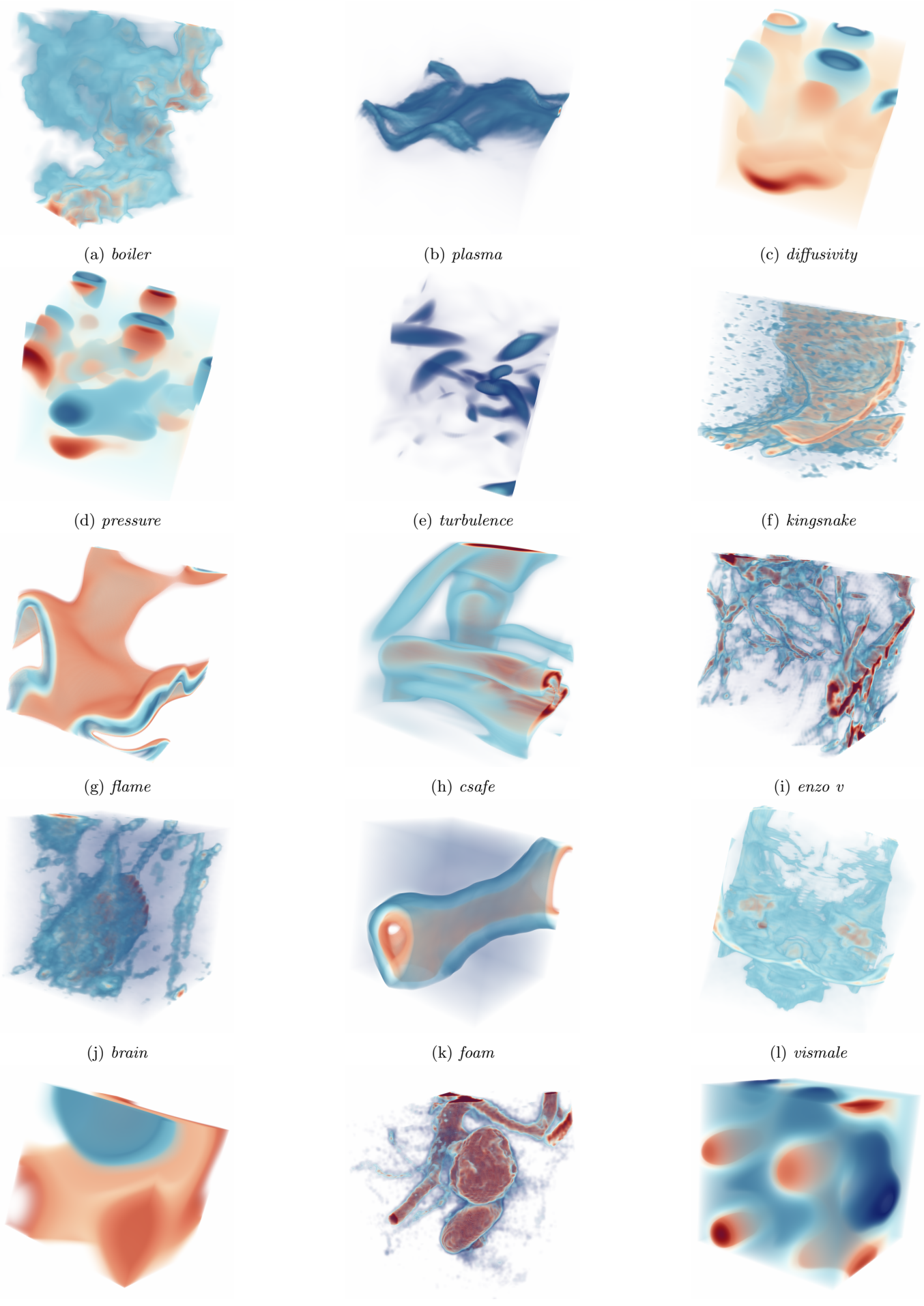


(a) *boiler* (b) *plasma* (c) *diffusivity*

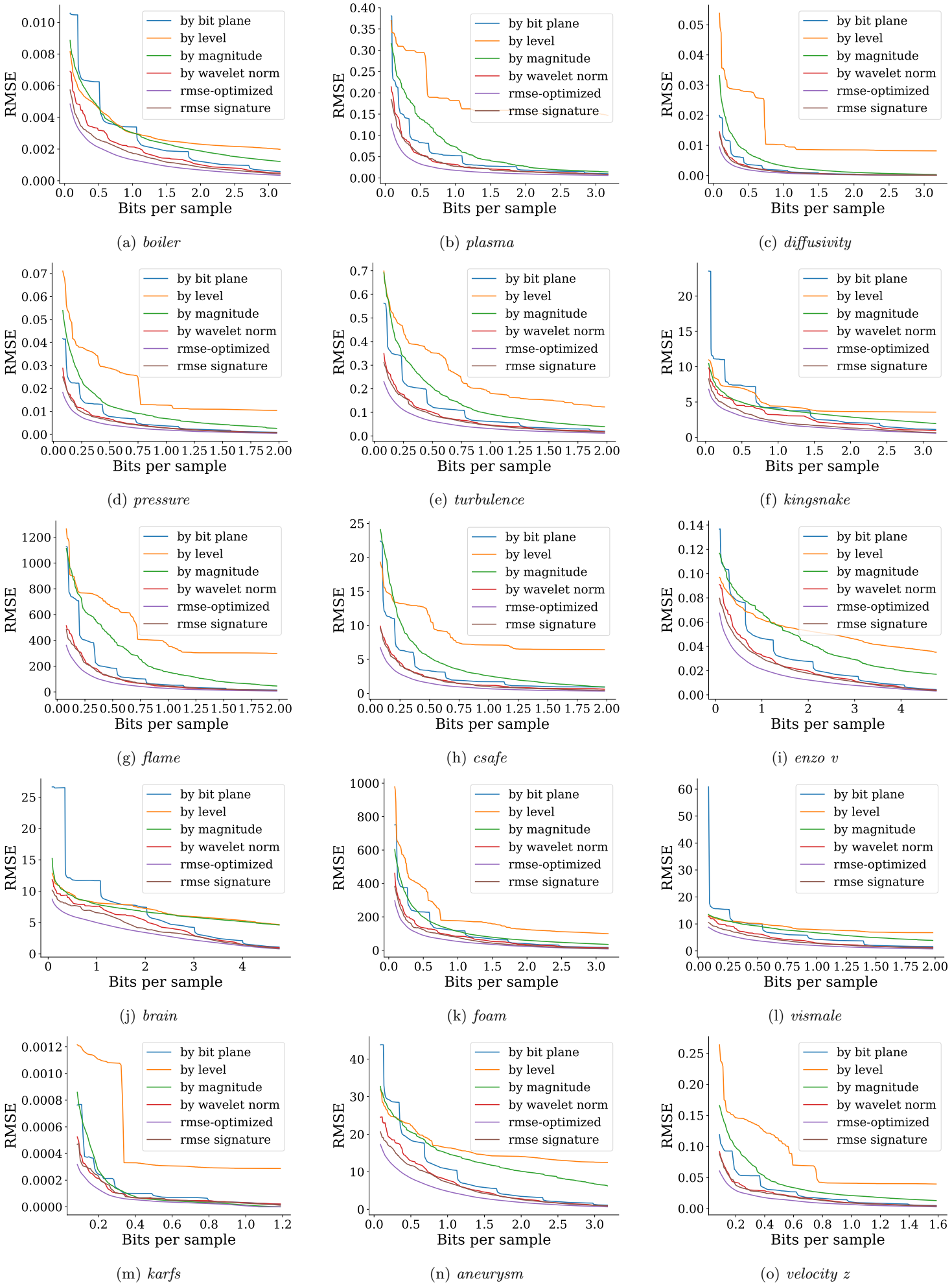
(d) *pressure* (e) *turbulence* (f) *kingsnake*

(g) *flame* (h) *csafe* (i) *enzo v*

(j) *brain* (k) *foam* (l) *vismale*

(m) *karfs* (n) *aneurysm* (o) *velocity z*

Figure 1: Volume renderings of all data sets



(a) *boiler* (b) *plasma* (c) *diffusivity*

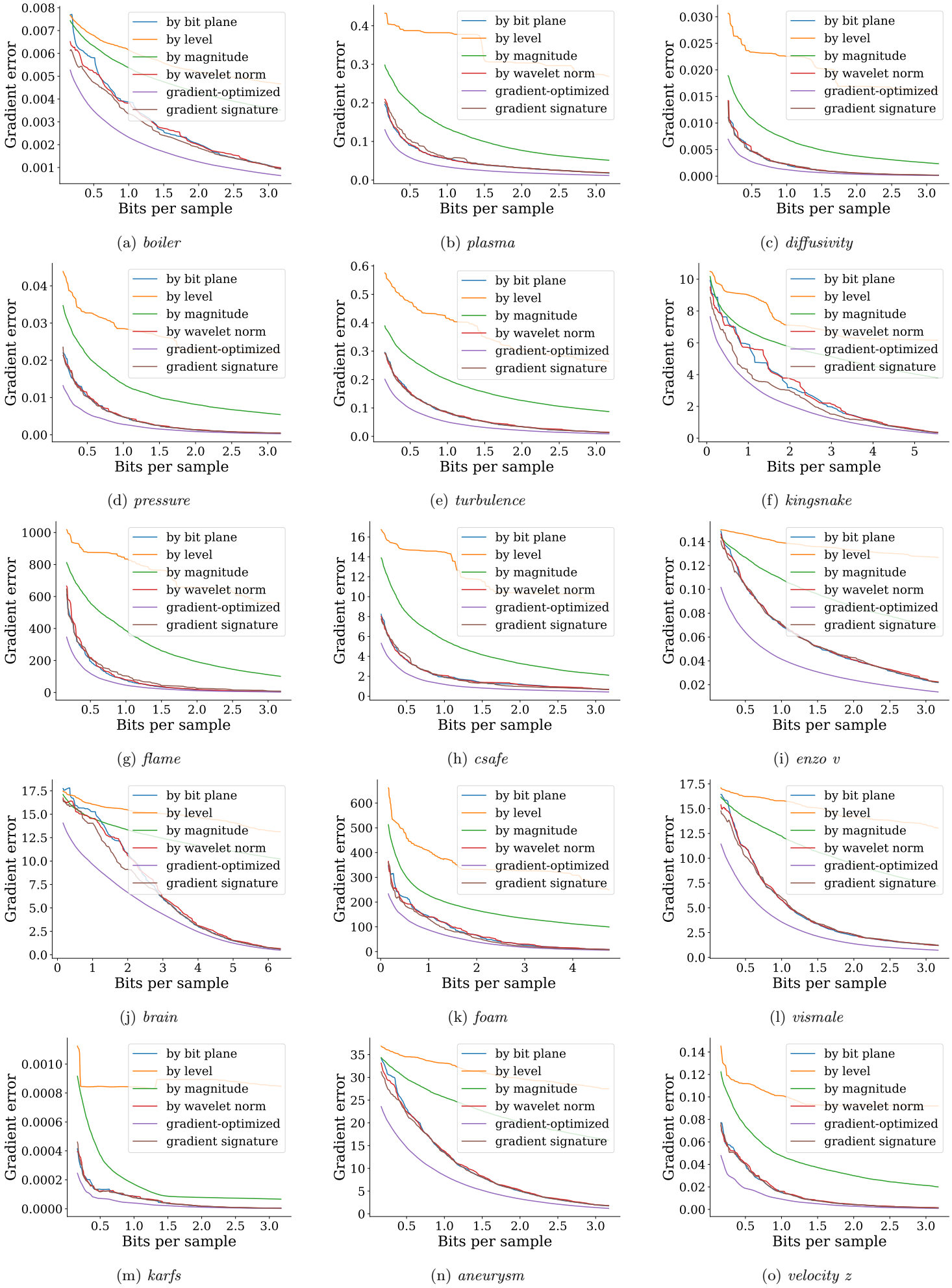
(d) *pressure* (e) *turbulence* (f) *kingsnake*

(g) *flame* (h) *csafe* (i) *enzo v*

(j) *brain* (k) *foam* (l) *vismale*

(m) *karfs* (n) *aneurysm* (o) *velocity z*

Figure 2: RMSE



(a) *boiler* (b) *plasma* (c) *diffusivity*

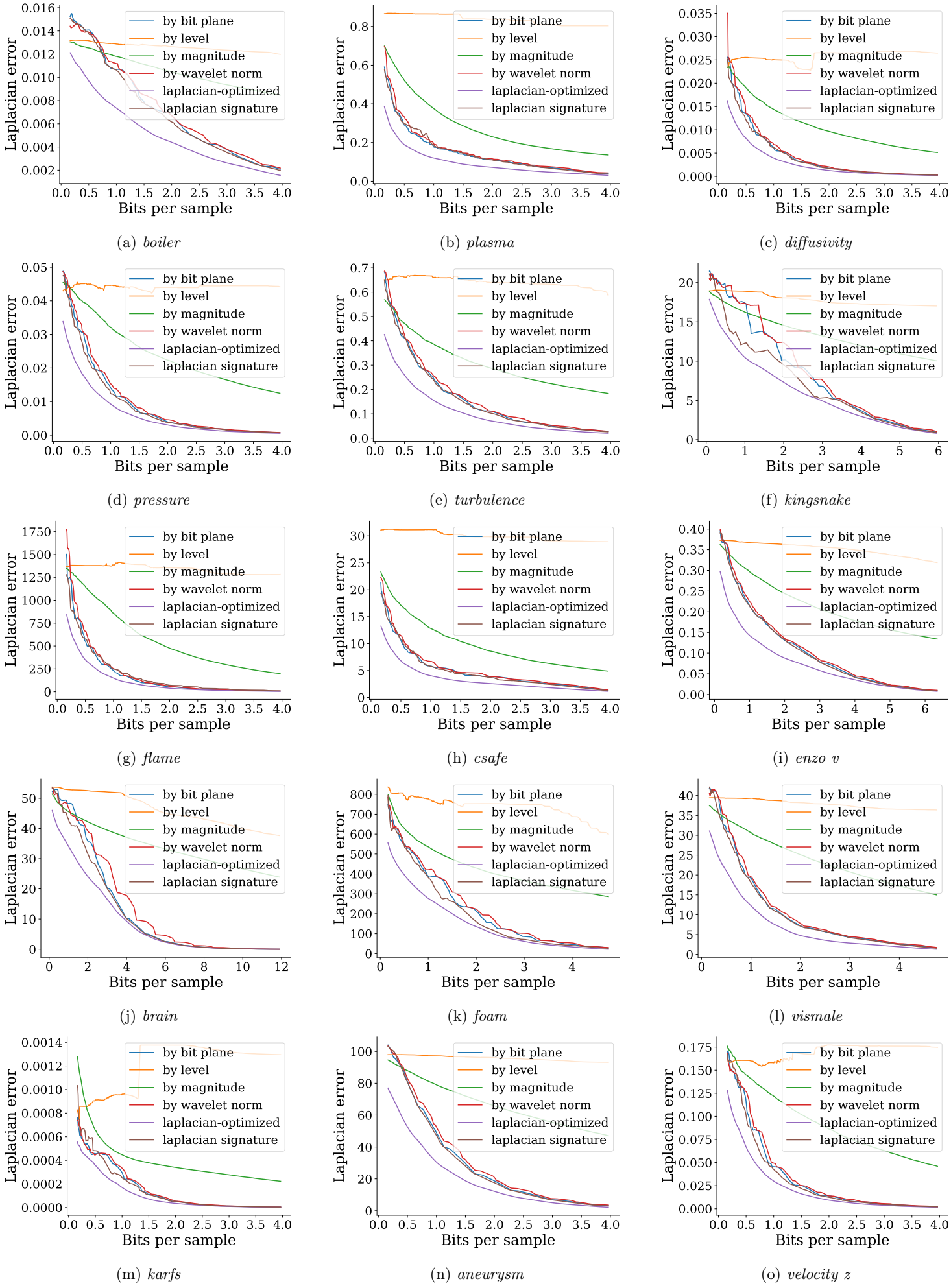
(d) *pressure* (e) *turbulence* (f) *kingsnake*

(g) *flame* (h) *csafe* (i) *enzo v*

(j) *brain* (k) *foam* (l) *vismale*

(m) *karfs* (n) *aneurysm* (o) *velocity z*

Figure 3: Gradient using 5-point stencil



(a) *boiler* (b) *plasma* (c) *diffusivity*

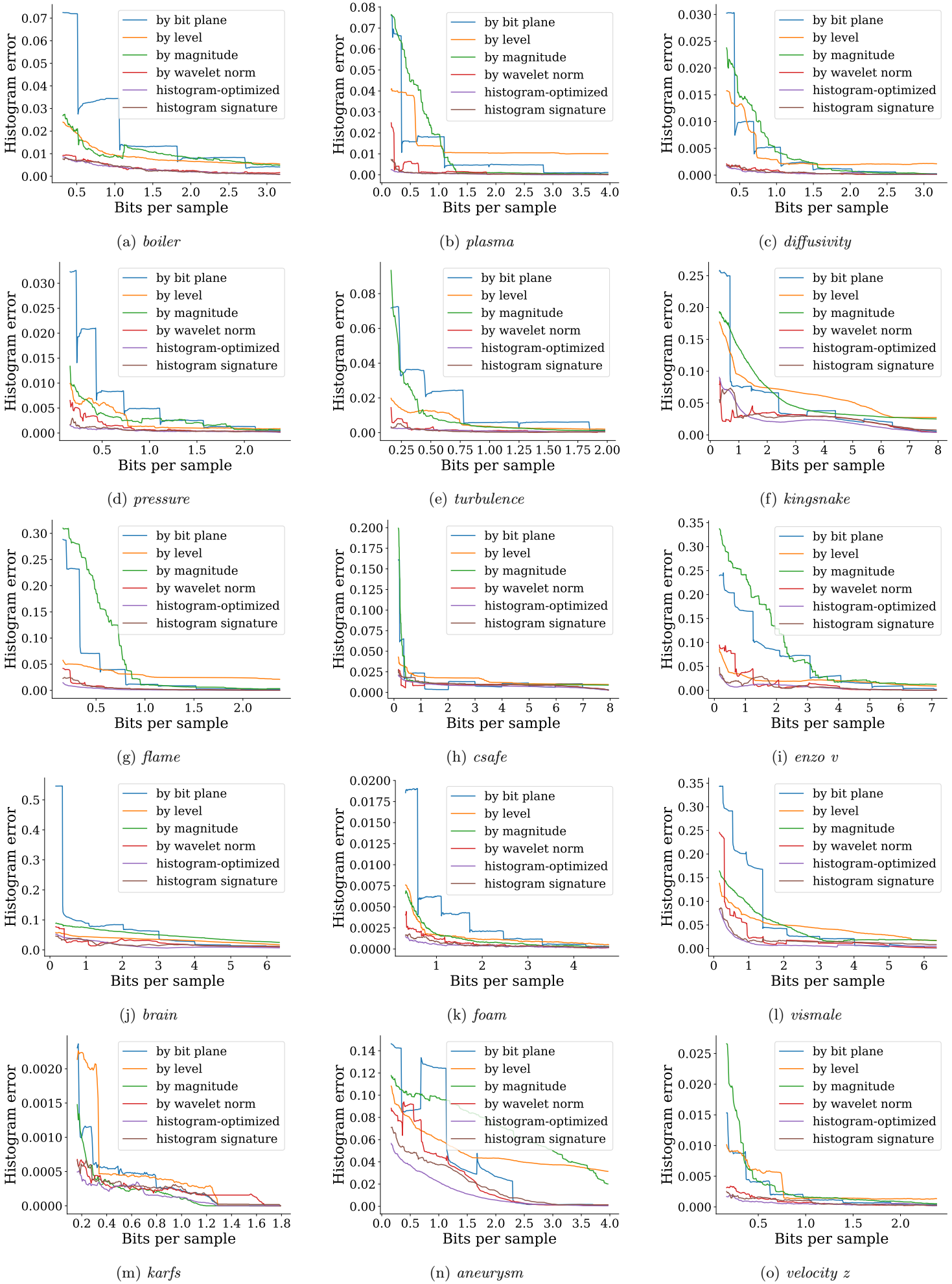
(d) *pressure* (e) *turbulence* (f) *kingsnake*

(g) *flame* (h) *csafe* (i) *enzo v*

(j) *brain* (k) *foam* (l) *vismale*

(m) *karfs* (n) *aneurysm* (o) *velocity z*

Figure 4: Laplacian using 5-point stencil



(a) *boiler* (b) *plasma* (c) *diffusivity*

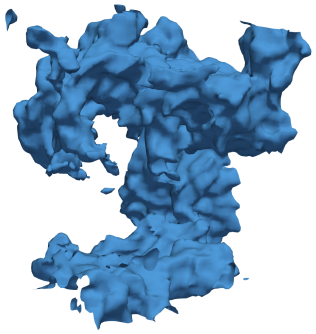
(d) *pressure* (e) *turbulence* (f) *kingsnake*

(g) *flame* (h) *csafe* (i) *enzo v*

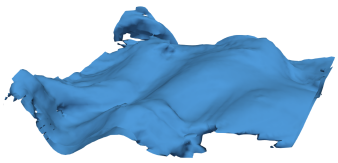
(j) *brain* (k) *foam* (l) *vismale*

(m) *karfs* (n) *aneurysm* (o) *velocity z*

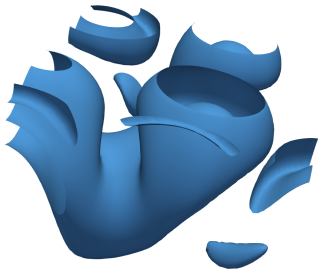
Figure 5: Histogram using 64 bins



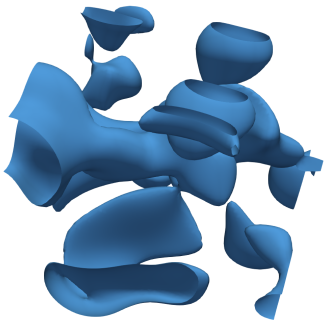
(a) *boiler, isovalue=0.5*



(b) *plasma, isovalue=2*

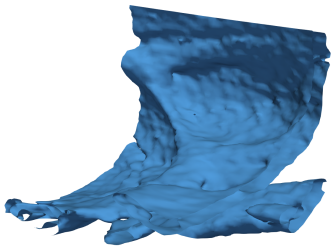


(c) *diffusivity, isovalue=-0.05*

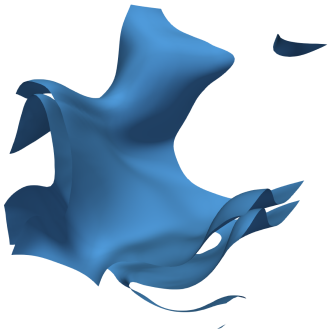


(d) *pressure, isovalue=0.2*

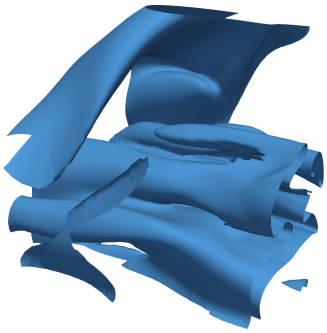
(e) *turbulence isovalue=5*



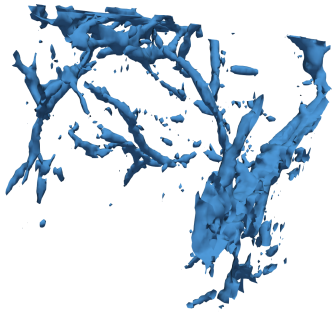
(f) *kingsnake, isovalue=106*



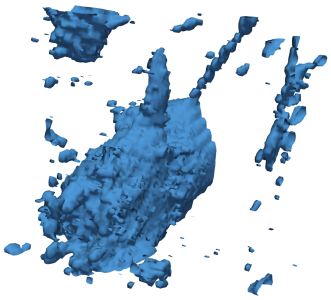
(g) *flame, isovalue=-6000*



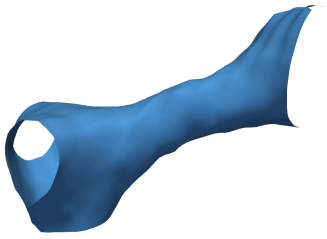
(h) *csafe, isovalue=60*



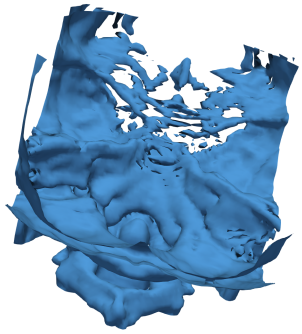
(i) *enzo v isovalue=0.4*



(j) *brain, isovalue=90*

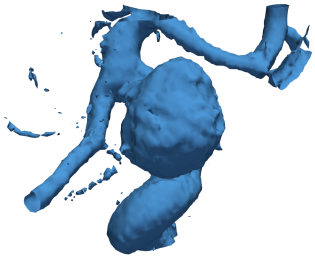


(k) *foam, isovalue=30934*

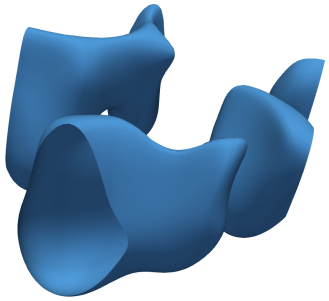


(l) *vismale, isovalue=80*

(m) *karfs, isovalue=2.8*

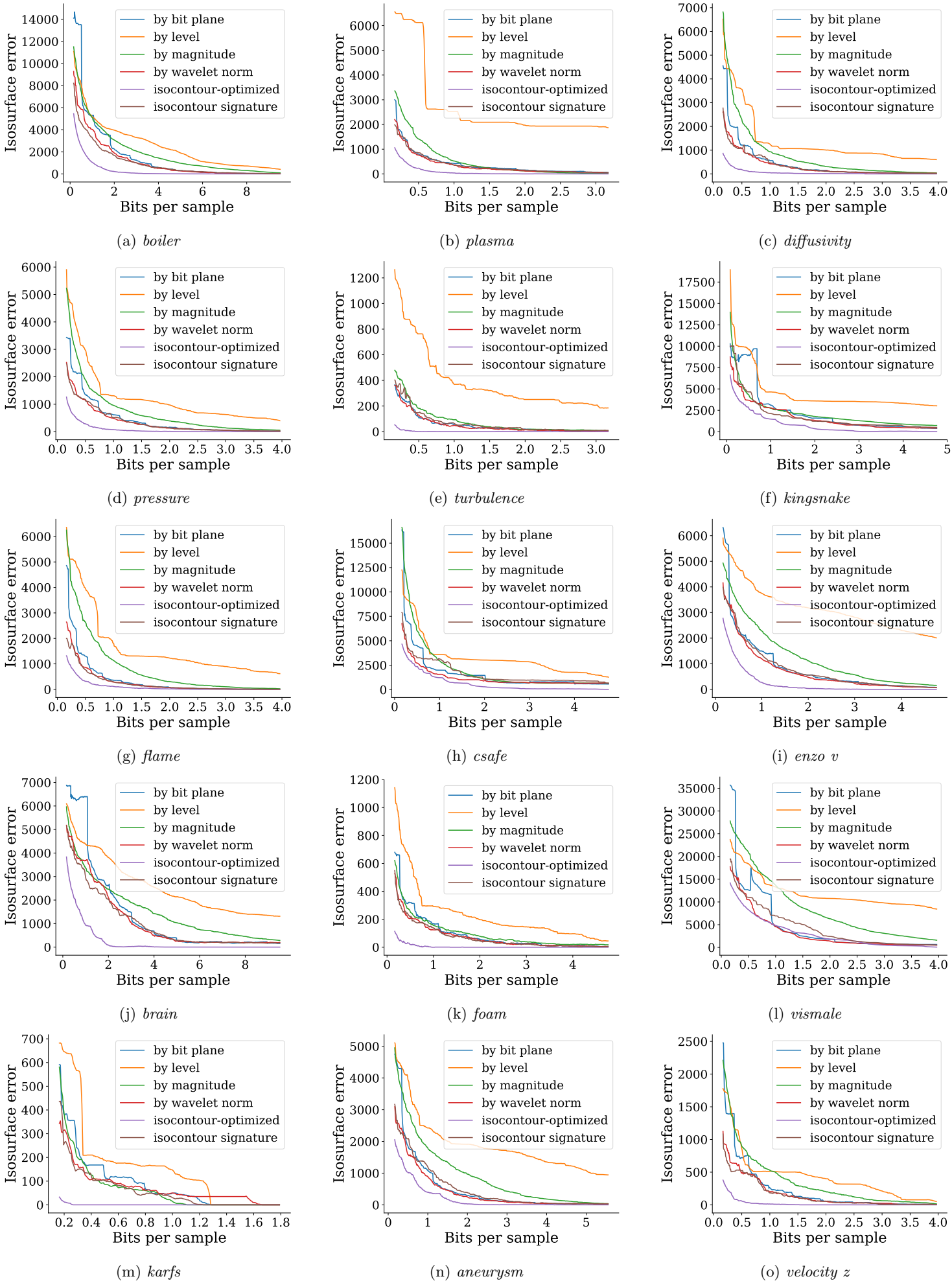


(n) *aneurysm, isovalue=127*



(o) *velocity z, isovalue=-2*

Figure 6: Isosurfaces (and isovalues) used for computing the isosurface errors



(a) *boiler* (b) *plasma* (c) *diffusivity*

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(g) *flame* (h) *csafe* (i) *enzo v*

(j) *brain* (k) *foam* (l) *vismale*

(m) *karfs* (n) *aneurysm* (o) *velocity z*

Figure 7: Isosurface