High-frequency surface kinetic energy in global high-resolution models

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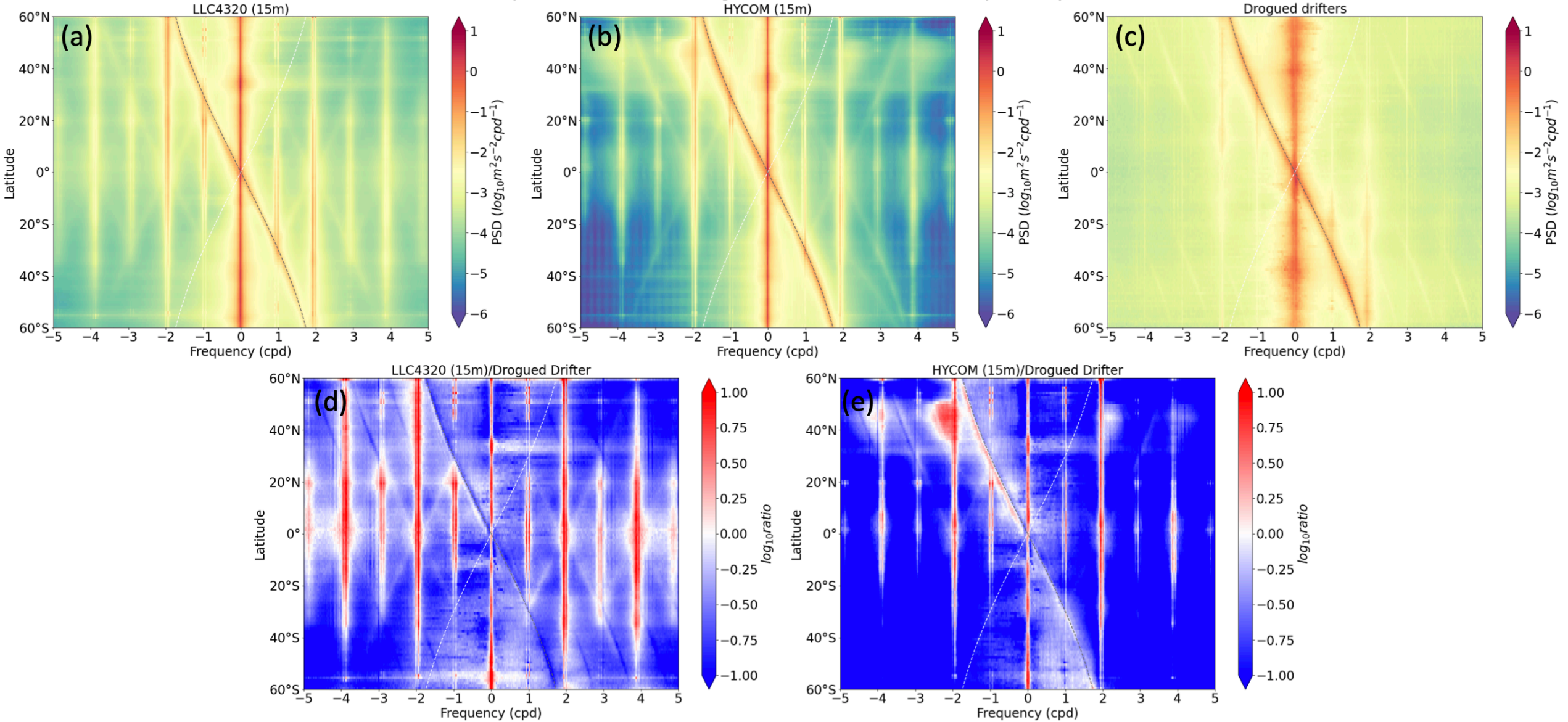
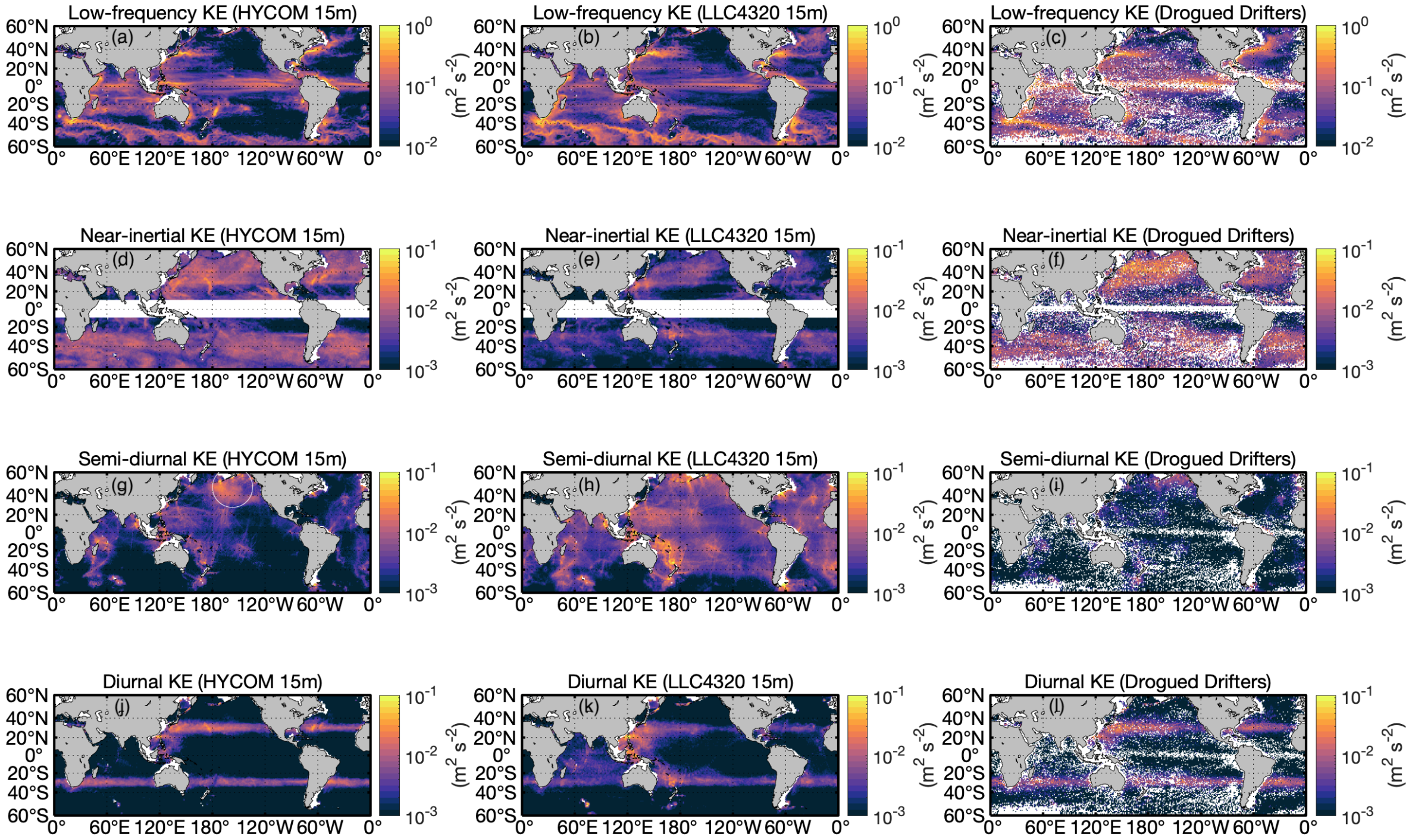
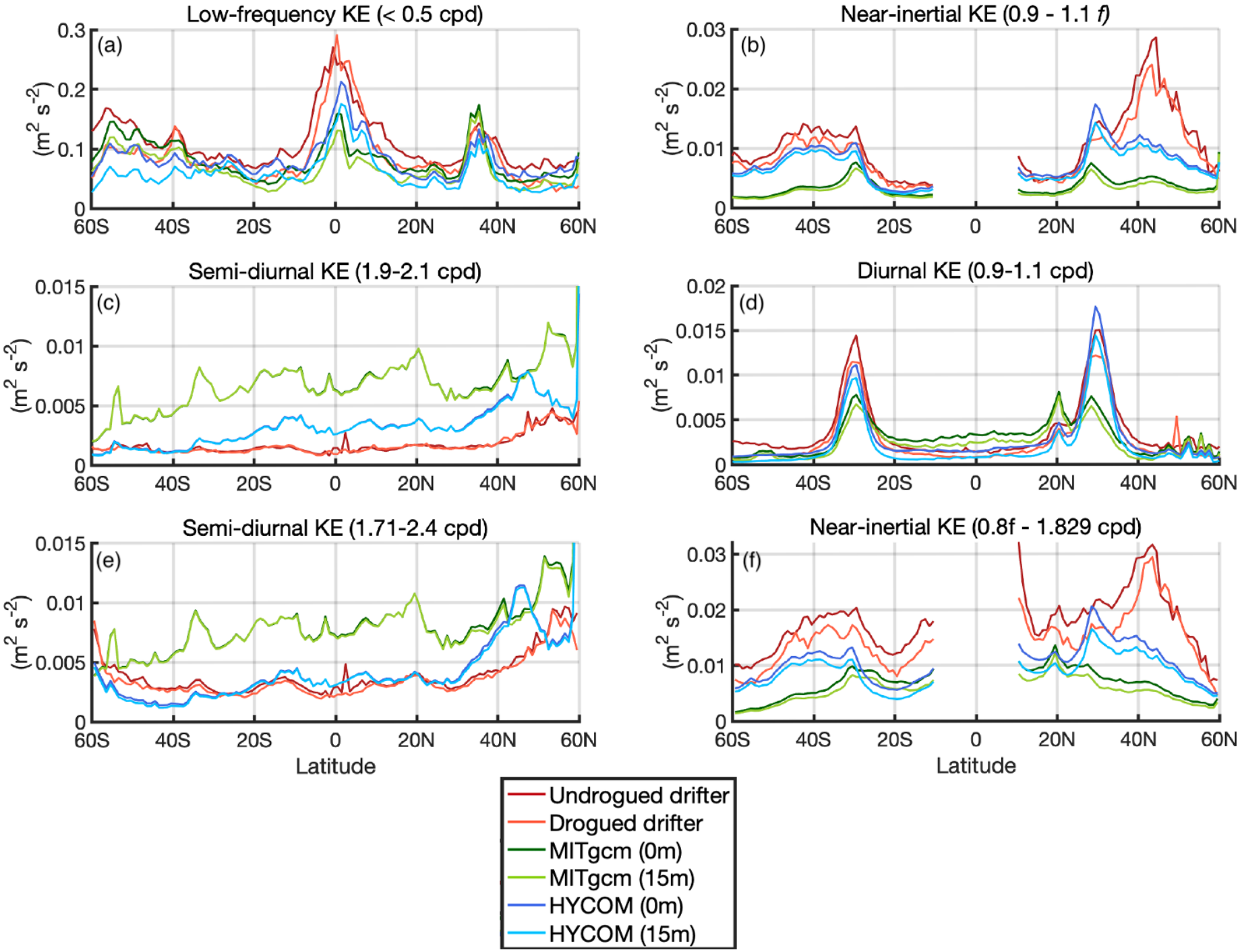
- We have been comparing the high-frequency motions in HYCOM and MITgcm to observations, especially altimetry and moorings

- Here we compare surface kinetic energy in HYCOM vs. drifters, building upon Yu et al. (2019) comparison of MITgcm vs. drifters

Zonally averaged rotary spectra




Low-frequency KE (HYCOM 15m)
Low-frequency KE (LLC4320 15m)
Low-frequency KE (Drogued Drifters)
Near-inertial KE (HYCOM 15m)
Near-inertial KE (LLC4320 15m)
Near-inertial KE (Drogued Drifters)
Semi-diurnal KE (HYCOM 15m)
Semi-diurnal KE (LLC4320 15m)
Semi-diurnal KE (Drogued Drifters)
Diurnal KE (HYCOM 15m)
Diurnal KE (LLC4320 15m)
Diurnal KE (Drogued Drifters)
(a)
(b)
(c)
(d)
(e)
(f)
(g)
(h)
(i)
(j)
(k)
(l)
60°N
40°N
20°N
0°
20°S
40°S
60°S
0°
60°E
120°E
180°
120°W
60°W
$(m^2\ s^{-2})$
10^{0}
10^{-1}
10^{-2}
10^{-3}


Low-frequency KE (< 0.5 cpd)
(a)
Near-inertial KE (0.9 - 1.1 f)
(b)
Semi-diurnal KE (1.9-2.1 cpd)
(c)
Diurnal KE (0.9-1.1 cpd)
(d)
Semi-diurnal KE (1.71-2.4 cpd)
(e)
Near-inertial KE (0.8f - 1.829 cpd)
(f)
(m2 s-2)
60S
40S
20S
0
20N
40N
60N
Latitude
Undrogued drifter
Drogued drifter
MITgcm (0m)
MITgcm (15m)
HYCOM (0m)
HYCOM (15m)

Conclusions

- Drifters provide a global dataset to discriminate differences between models
- More frequently updated wind fields provide greater near-inertial energy in HYCOM, thus a closer agreement with drifters, than in MITgcm.
- Northern hemisphere near-inertial motions in HYCOM, though closer to drifters, are still too weak→under investigation.
- Tidal KE in HYCOM is too strong relative to drifters but is not as strong as MITgcm, mainly due to inclusion of wave drag in HYCOM/lack of wave drag in MITgcm.
- In zonal averages, both models display higher energy at 0 m than at 15 m in near-inertial, diurnal, and low-frequency bands, in qualitative agreement with results in undrogued vs. drogued drifters.