

Interactive comment on “Element-by-element parallel spectral-element methods for 3-D acoustic-wave-equation-based teleseismic wave modeling” by Shaolin Liu et al.

Anonymous Referee #1

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The authors derived and presented a new hybrid numerical method which combines the spectral-element method and the frequency-wavenumber (FK) method for simulating teleseismic waves. Mainly constrained by the computational ability and resources of nowadays, the hybrid methods are highly demanded for modeling relatively high frequency teleseismic waves and for the purpose of generating high-resolution subsurface images. This paper is well organized and well written. It is suitable for publishing in Solid Earth if the authors can address the following concerns.

1. The authors called the discussing numerical method as the element-by-element parallel spectral-element method. What is the mathematical difference between your

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EBE-SEM and the so-called traditional SEM (your probably mean the one proposed in Komatitsch et al. 1998 as you cited this paper)? Why do you call it element-by-element? Do you also mean that the Komatitsch one cannot be paralleled in an element-by-element way?

2. It is better to move the first two sentences in Abstract to the Introduction section.

3. Line 31. In the past fourth years -> In the past forty years

4. Lines 35-38. It is hard to understand “For the requirements of . . . ,”

5. Lines 39-41. by two times of numerical solving full seismic wave equations -> To reduce the storage requirement, Tromp et al. actually need to solve three wave equations to compute a wanted kernel.

6. Line 43. the seismic wave-equation-based adjoint waveform tomography. You have a long but seldom used name for adjoint tomography. Just use adjoint tomography.

7. Line 48. Related to the earthquake events -> related to the number of earthquakes

8. Line 53. In local region seismic tomography -> In local seismic tomography

9. Line 106. Misfit kernel -> Please use sensitivity kernel instead

10. Line 175. Are -> is

11. Line 201. A discussion of -> Discussion of

12. Line 225. For storage -> for the storage

13. Line 401. Waveform misfit kernel -> waveform kernel

14. Lines 562-565. How do you estimate the storage of the stiffness matrix for the traditional SEM? Have you used the SPECSEM2D or SPECSEM3D package?

15. Line 591. By subtraction of -> by subtracting

16. Figures 3, 6, and 8 are not very clear to the readers, especially the annotations of

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the scales. You may want to use color figures instead.

17. This hybrid method is based on the acoustic wave equation. If it is possible, the discussion based on the elastic wave equation is more interesting.

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