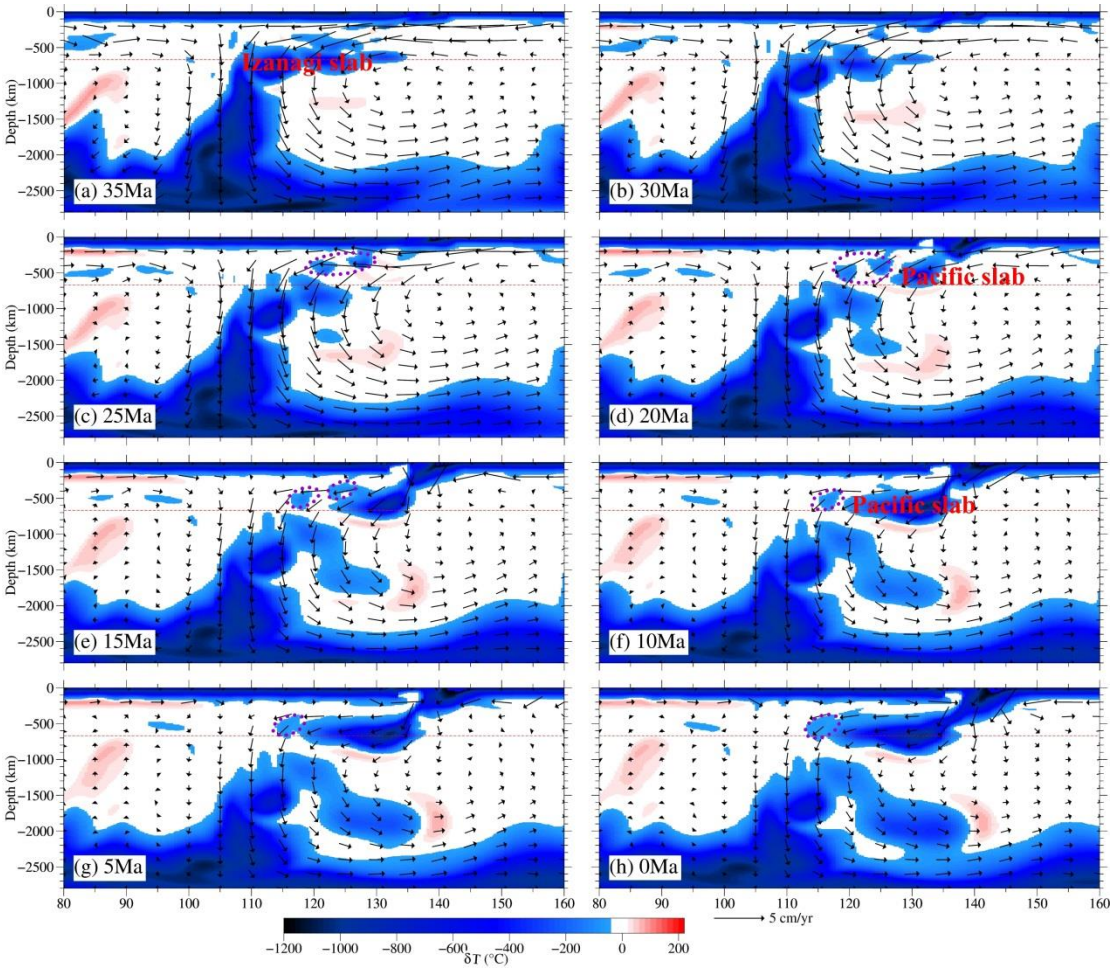

Fig. S1. Dynamic subduction process of the Pacific slab beneath the CVP since 35 Ma predicted by the best-fit geodynamic model presented by Zhu (2024). The areas enclosed by purple dash lines stand for the delaminated continental lithosphere.

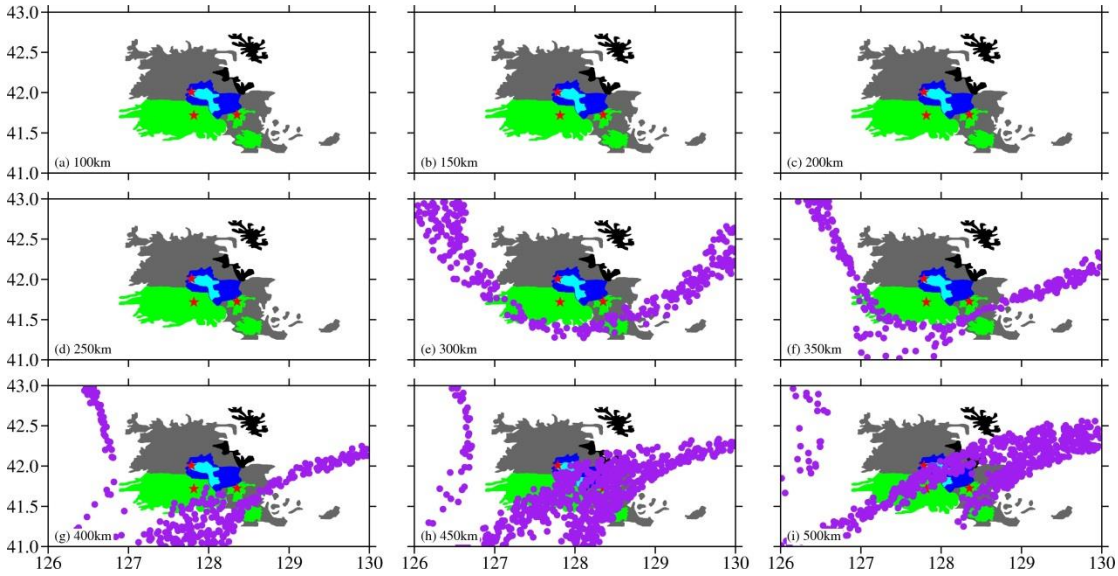

Fig. S2. Distribution of oceanic asthenosphere material (purple) with depth at 20 Ma

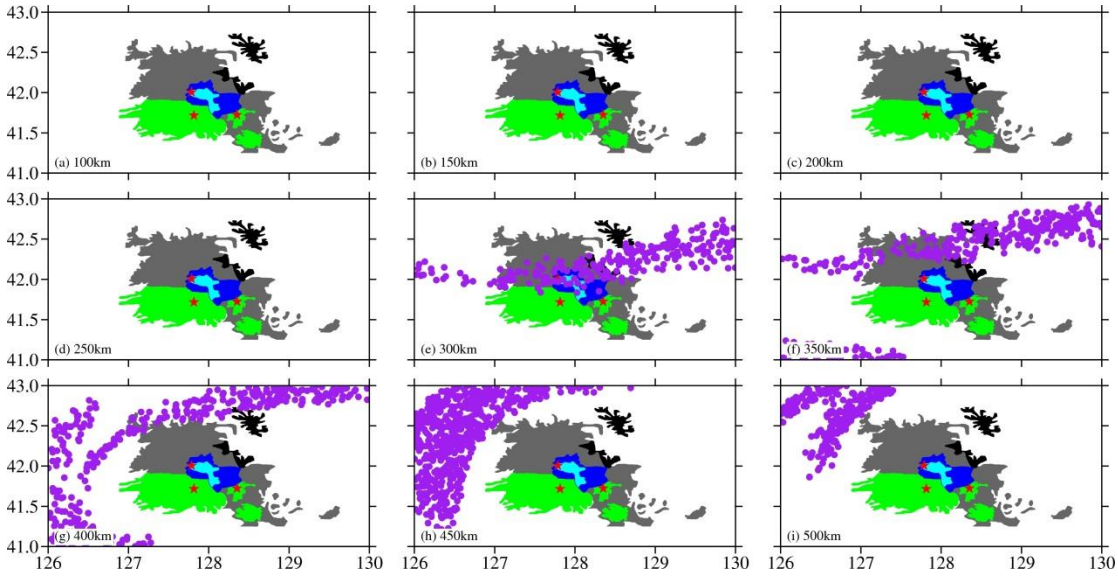

Fig. S3. Distribution of oceanic asthenosphere material (purple) with depth at 15 Ma

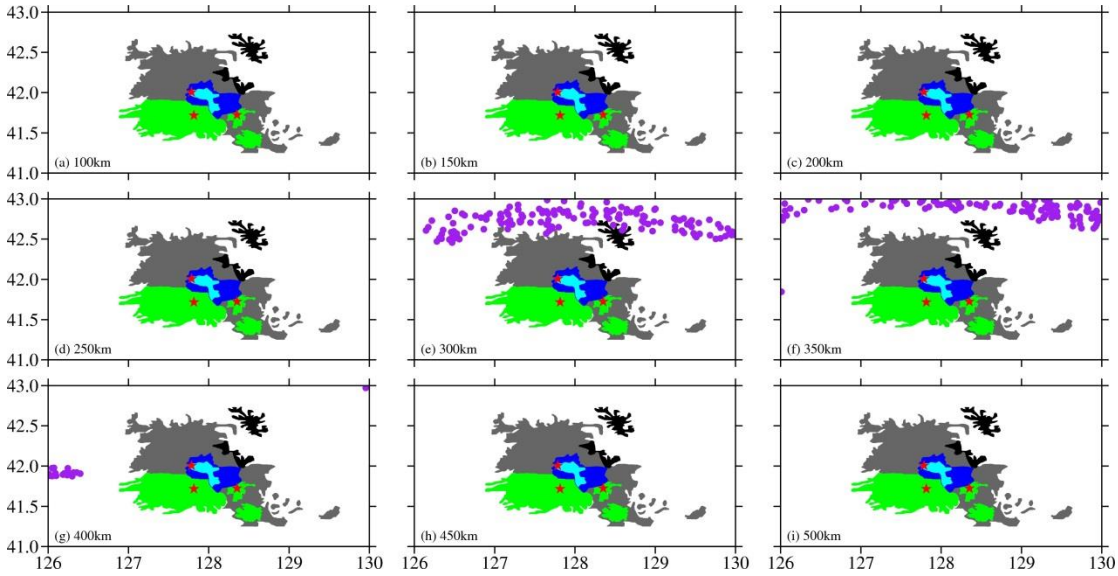

Fig. S4. Distribution of oceanic asthenosphere material (purple) with depth at 10 Ma

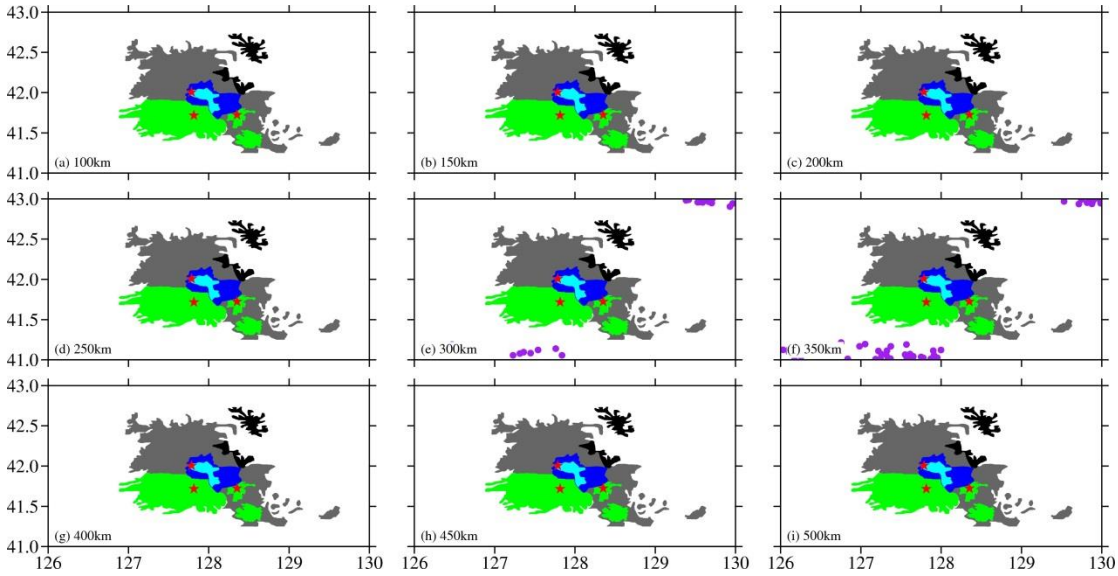

Fig. S5. Distribution of oceanic asthenosphere material (purple) with depth at 5 Ma

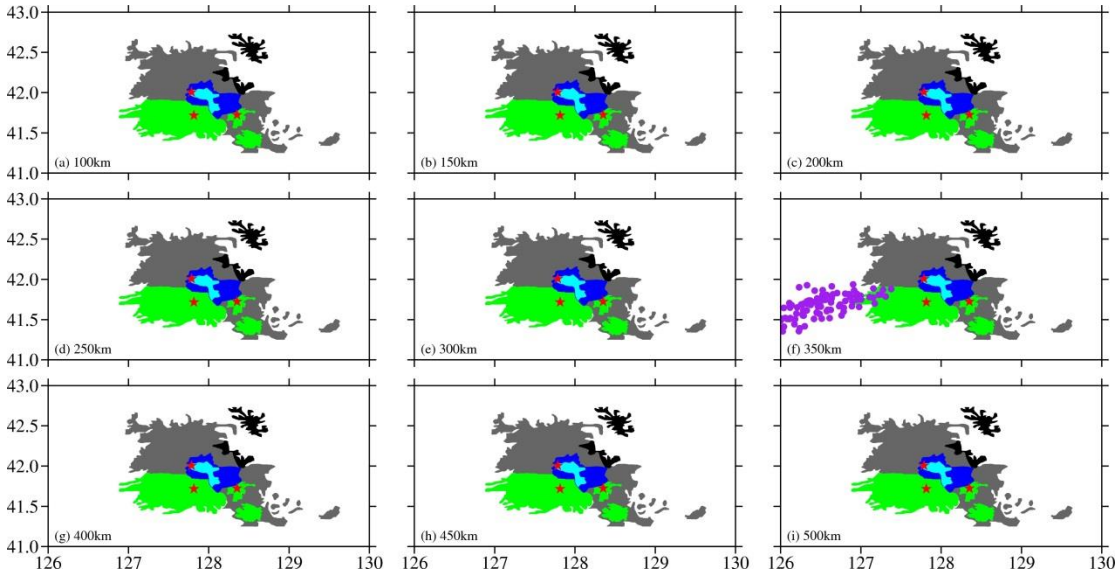

Fig. S6. Distribution of oceanic asthenosphere material (purple) with depth at the present (0 Ma)

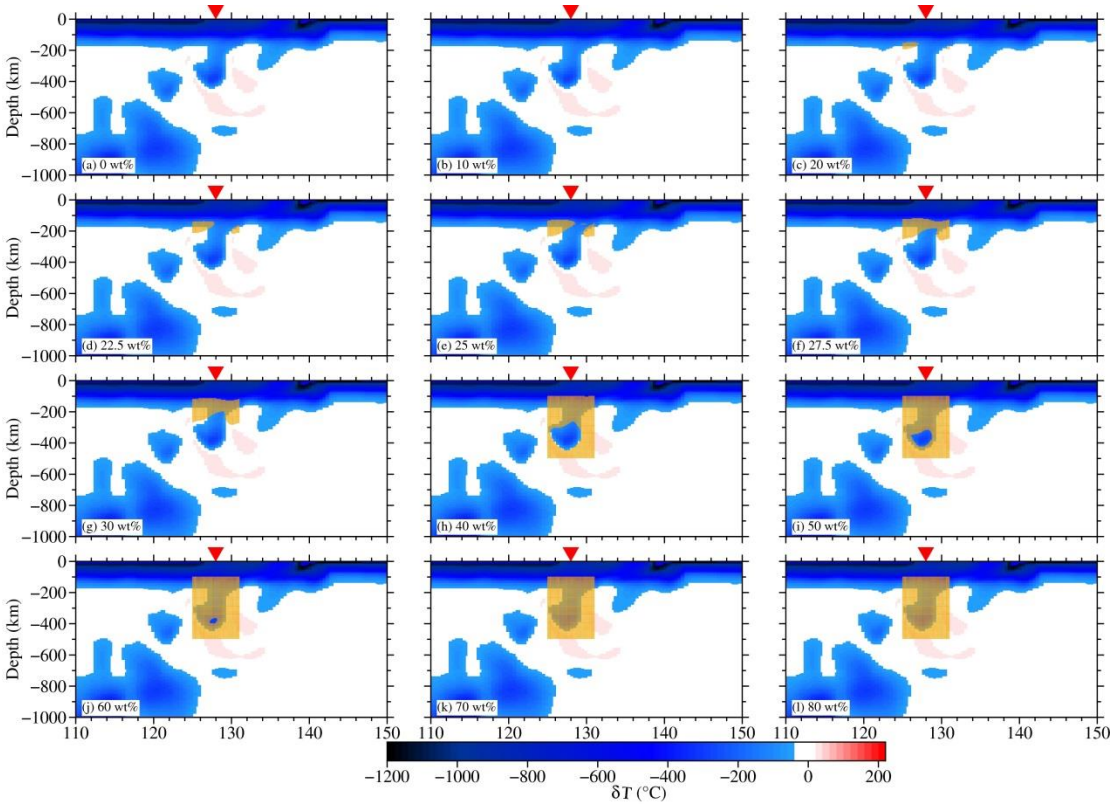

Fig. S7. Melts (orange) in the mantle beneath the CVP along latitude 41.67°N at 25 Ma varying with W_{H_2O}

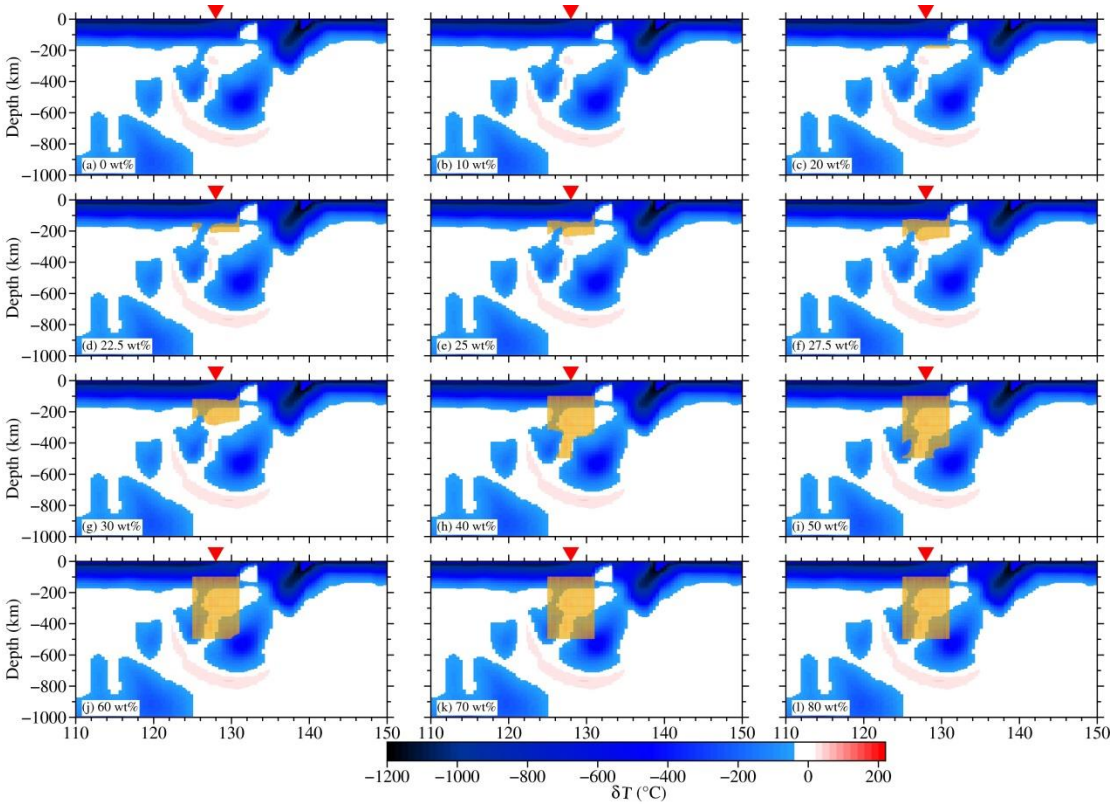

Fig. S8. Melts in the mantle beneath the CVP along latitude 41.67°N at 20 Ma varying with W_{H_2O}

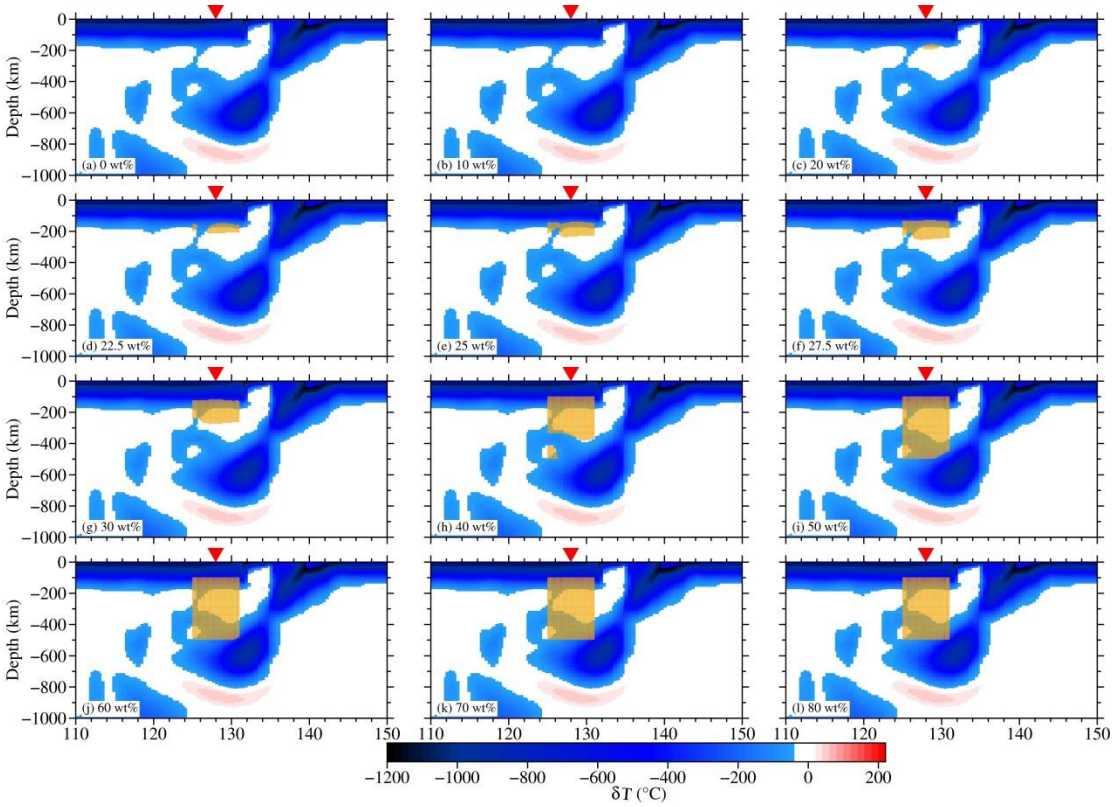

Fig. S9. Melts in the mantle beneath the CVP along latitude 41.67°N at 15 Ma varying with W_{H_2O}

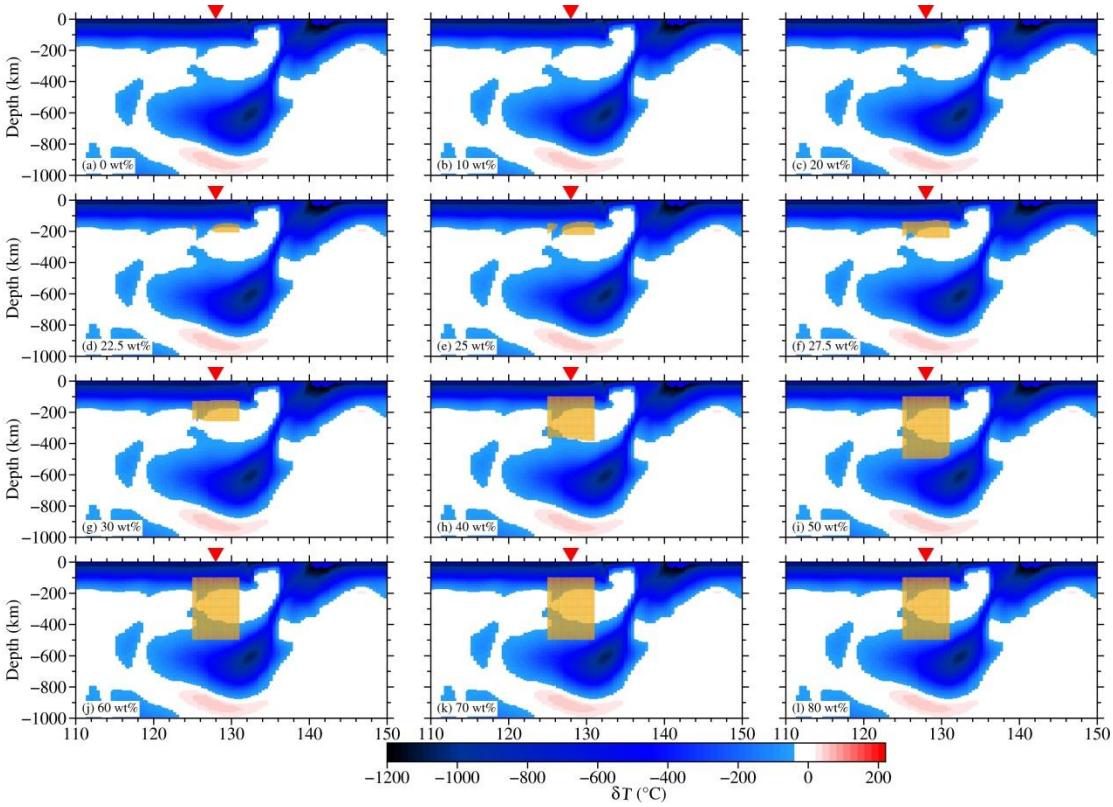

Fig. S10. Melts in the mantle beneath the CVP along latitude 41.67°N at 10 Ma varying with W_{H_2O}

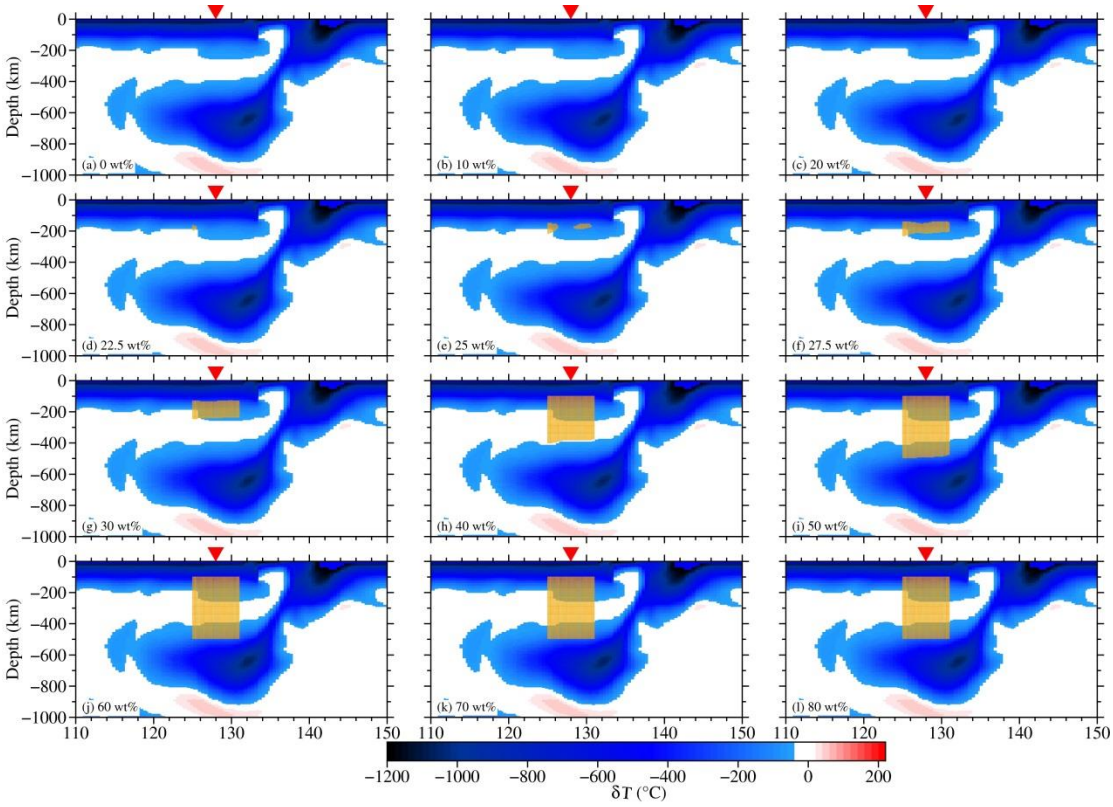

Fig. S11. Melts in the mantle beneath the CVP along latitude 41.67°N at 5 Ma varying with W_{H_2O}

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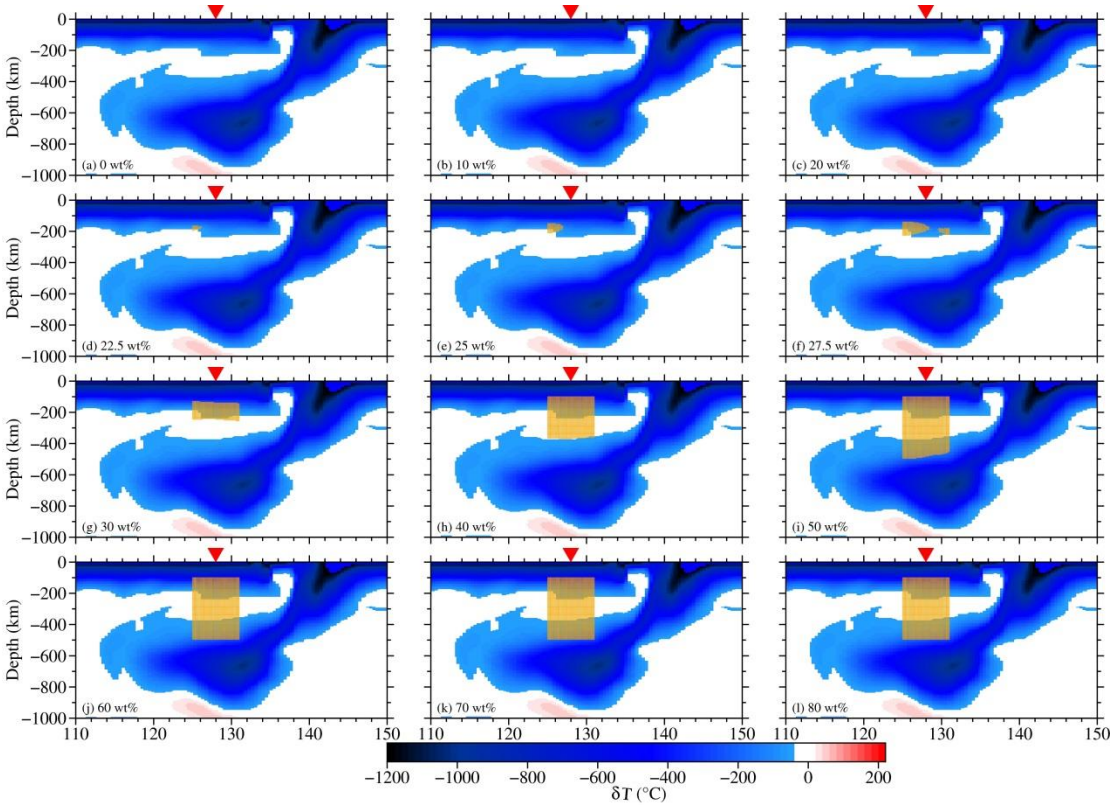

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200 Fig. S12. Melts in the mantle beneath the CVP along latitude 41.67°N at 0 Ma (present-day)

201 varying with W_{H_2O}

202