جامعة الملك عبدالله للعلوم والتقنية
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Modeling principal stress orientations in the Arabian plate using plate velocities

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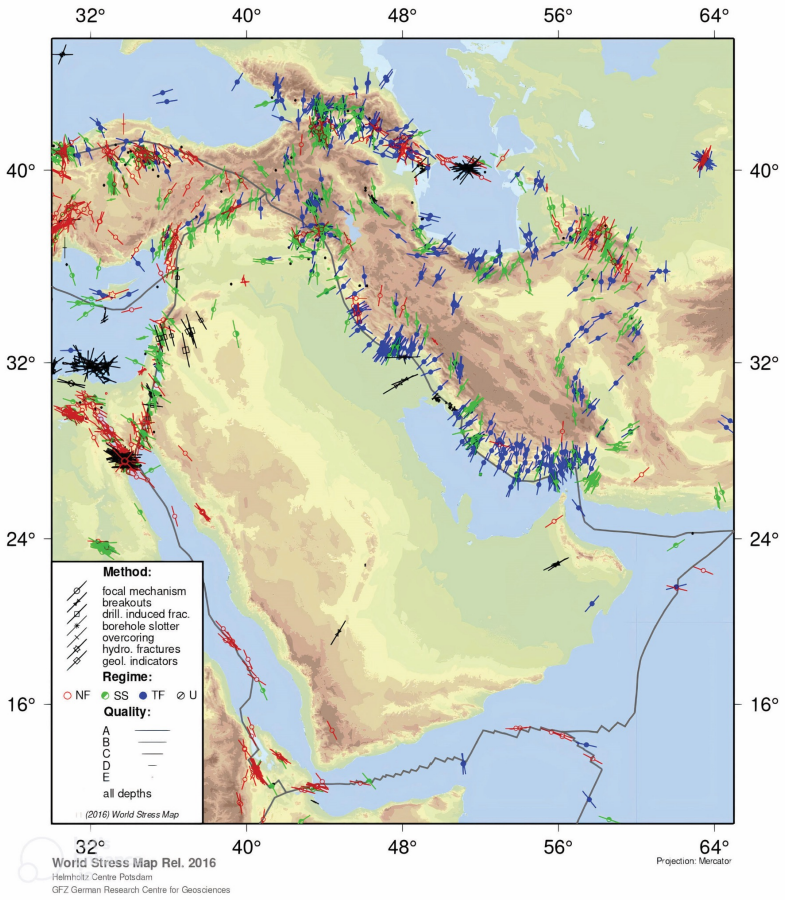
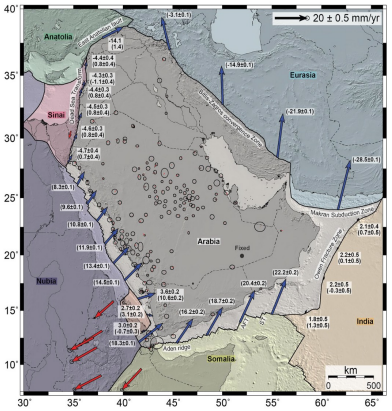
1. Motivation

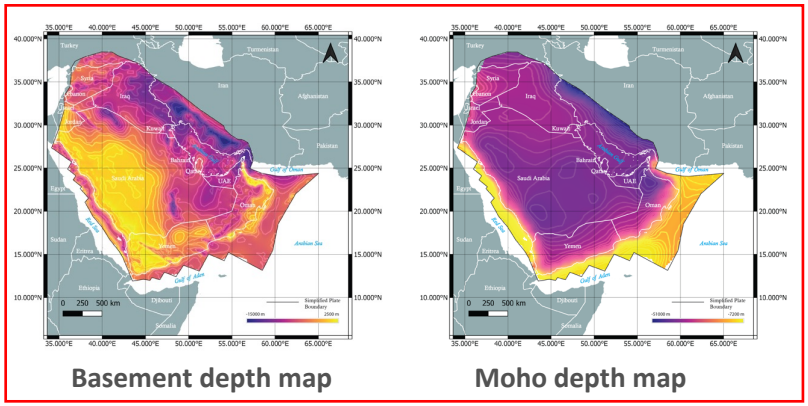


- On the Arabian peninsula countless wells have been drilled and logged, yet the WSM database lacks borehole-related stress indicators, Rajabi et al. (2014).
- Numerical stress modeling serves to understand the ongoing deformation process in the Arabian Plate and predict the in-situ stresses – in particular in previously unexplored regions.
- This work is an extension and refinement of a previously published plate deformation model by Goteti et al. (2022).

2. Workflow For Plate Deformation Modeling

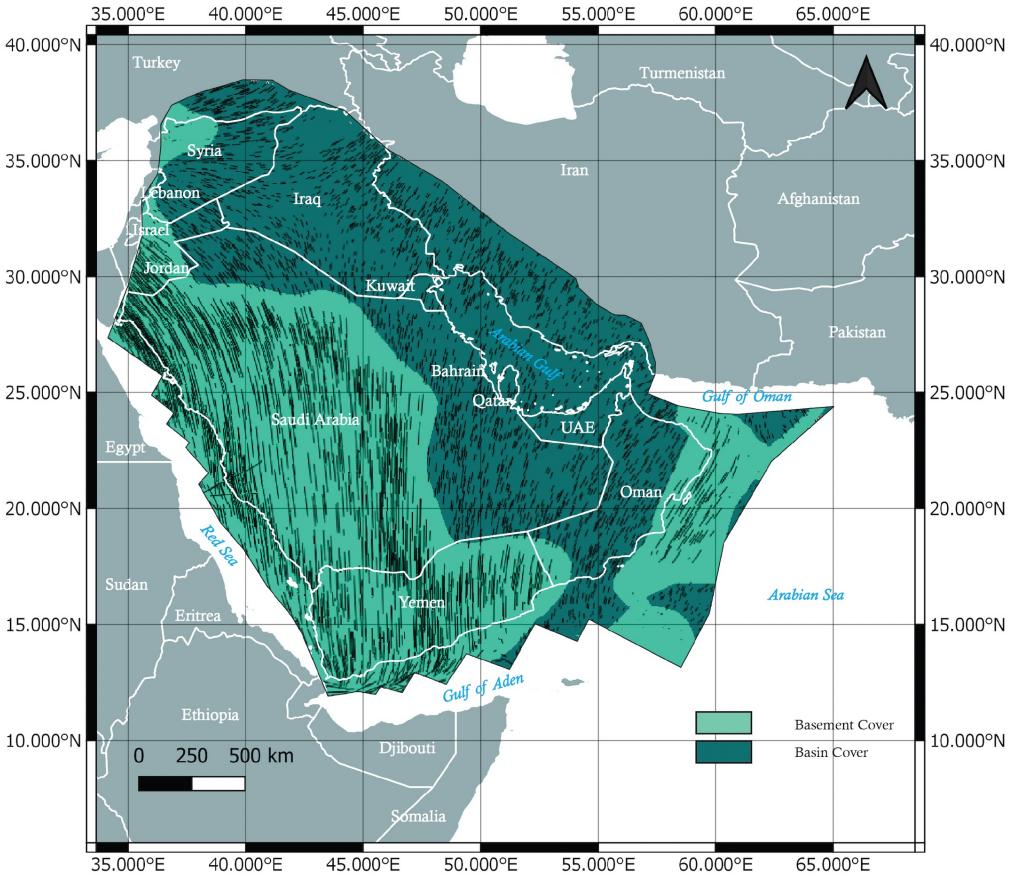
- Subsurface model
- Meshing
- Rock properties
- Initial stress state
- Displacement BC
- FE Analysis
- Stress field





- Updated basement and Moho depth maps.
- Model geometry covers the whole Arabian plate including water bodies.
- Detailed plate velocity model by Viltres et al. (2022).
- Refined FE mesh in critical areas.

3. Comparison Between Simulation Results and Available S_{Hmax} Data



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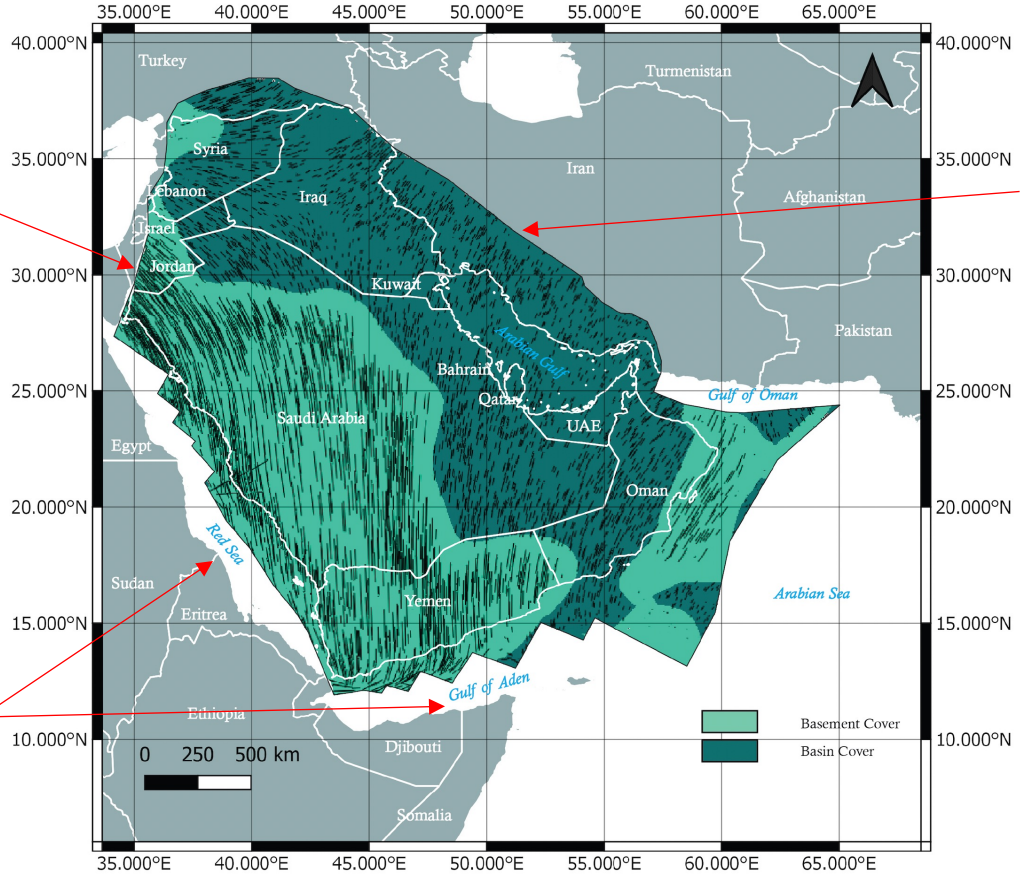
Major Tectonic Elements

Transform Fault System

Collision Zone

Seafloor Spreading



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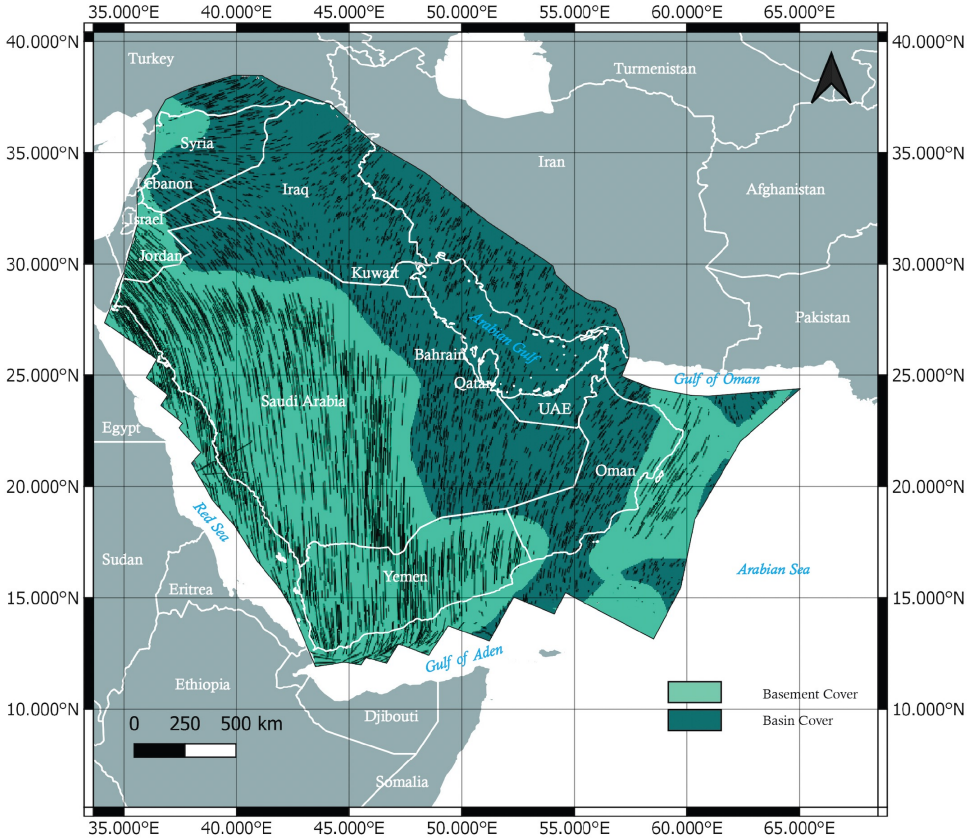

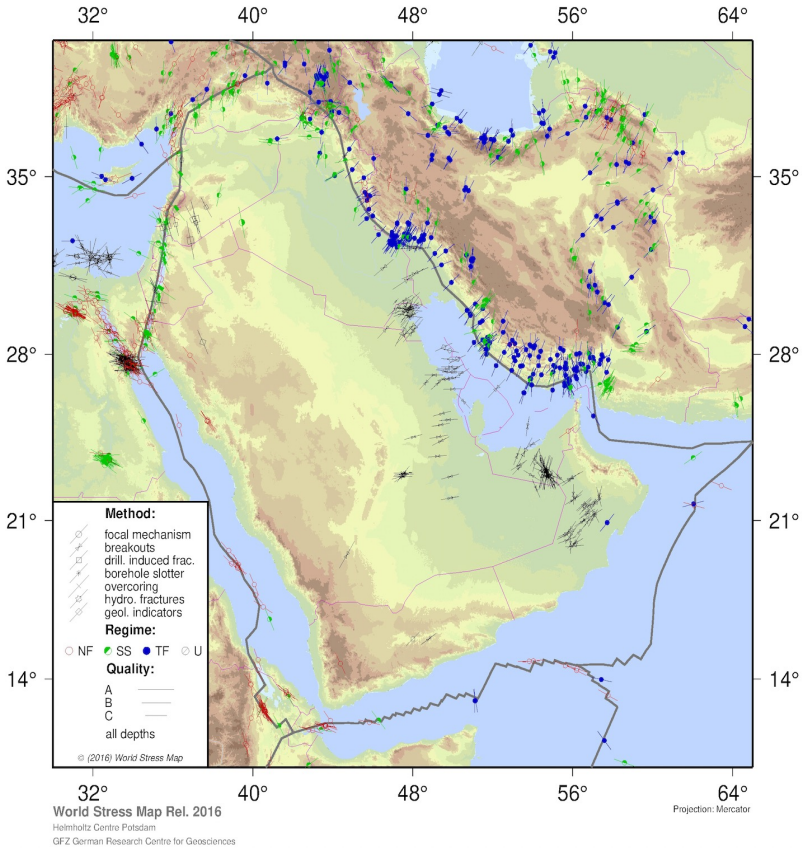

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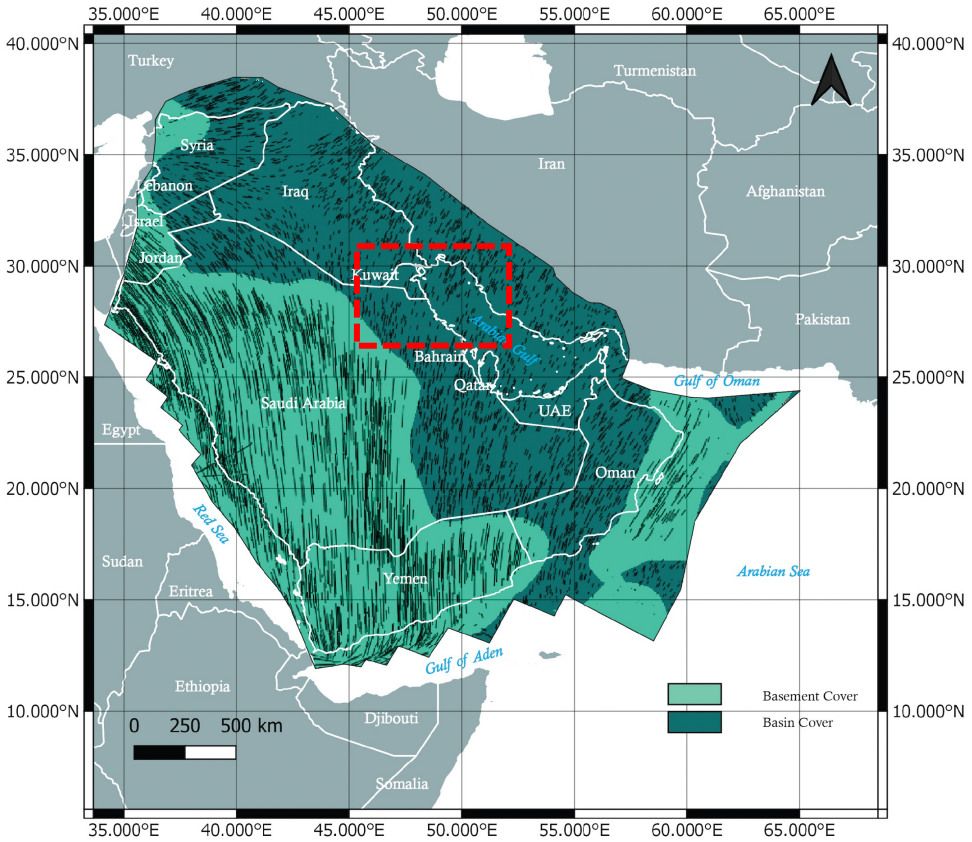

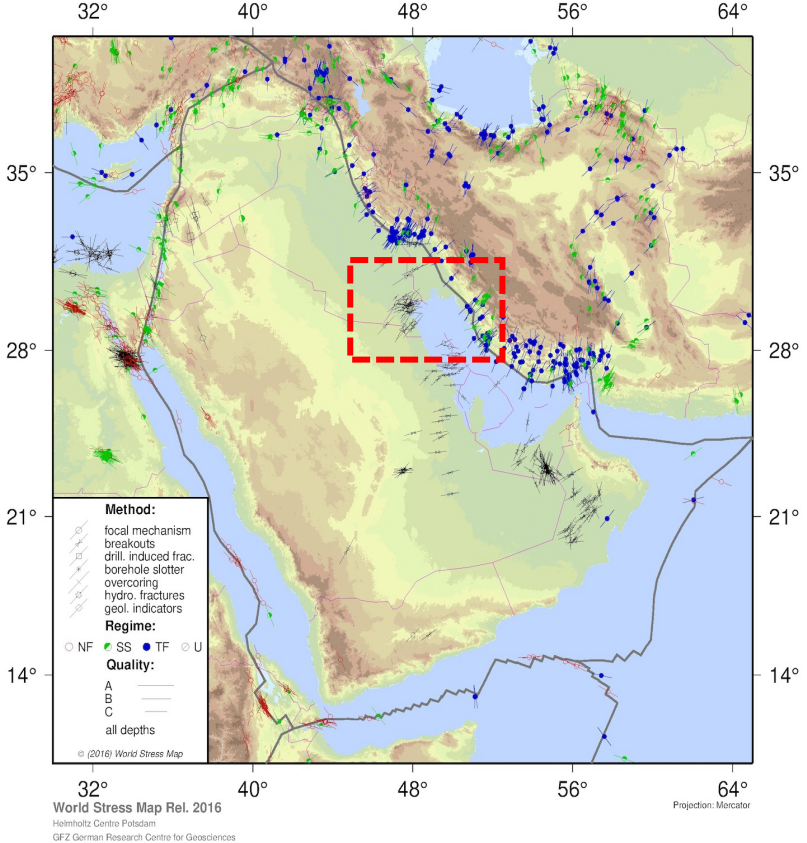

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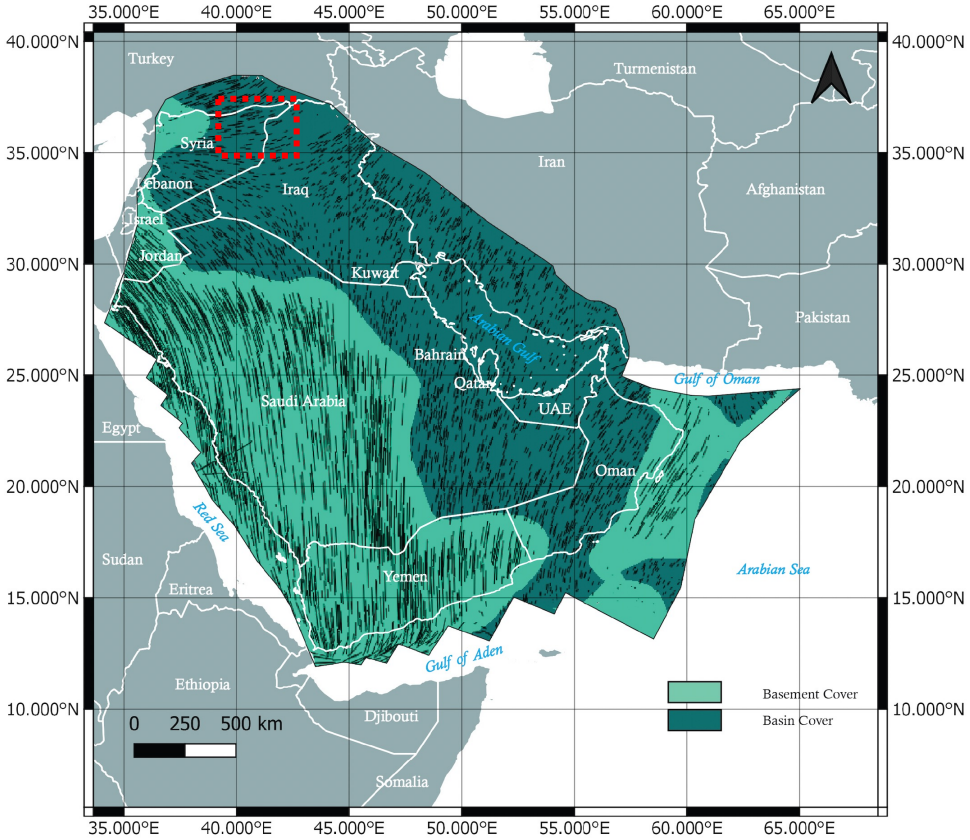

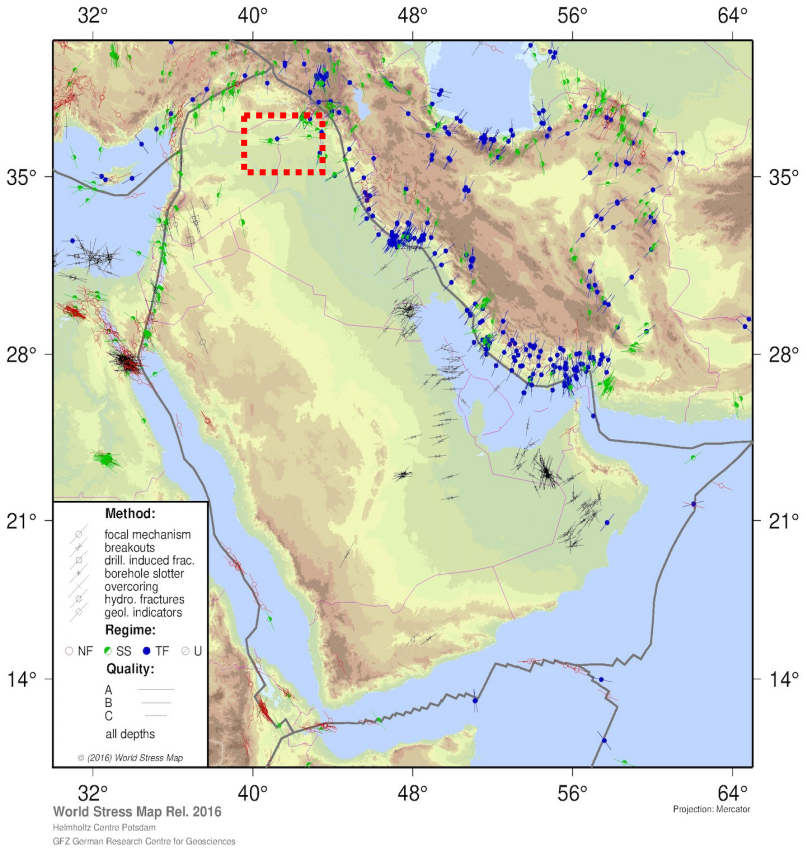

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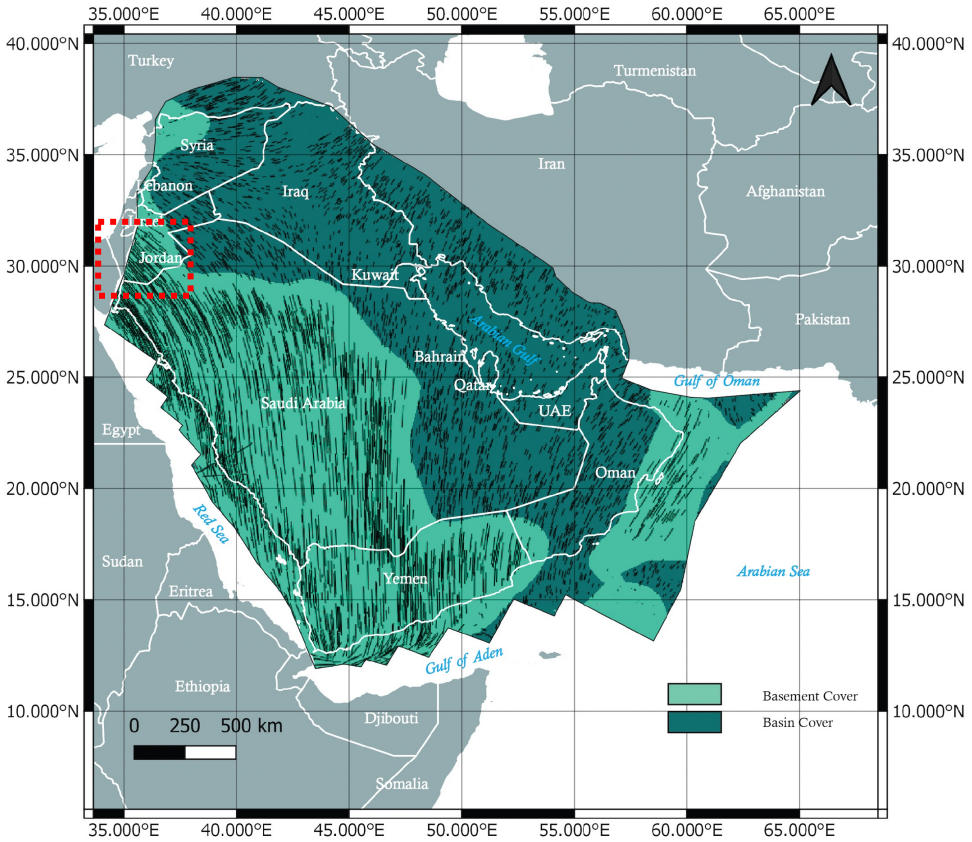

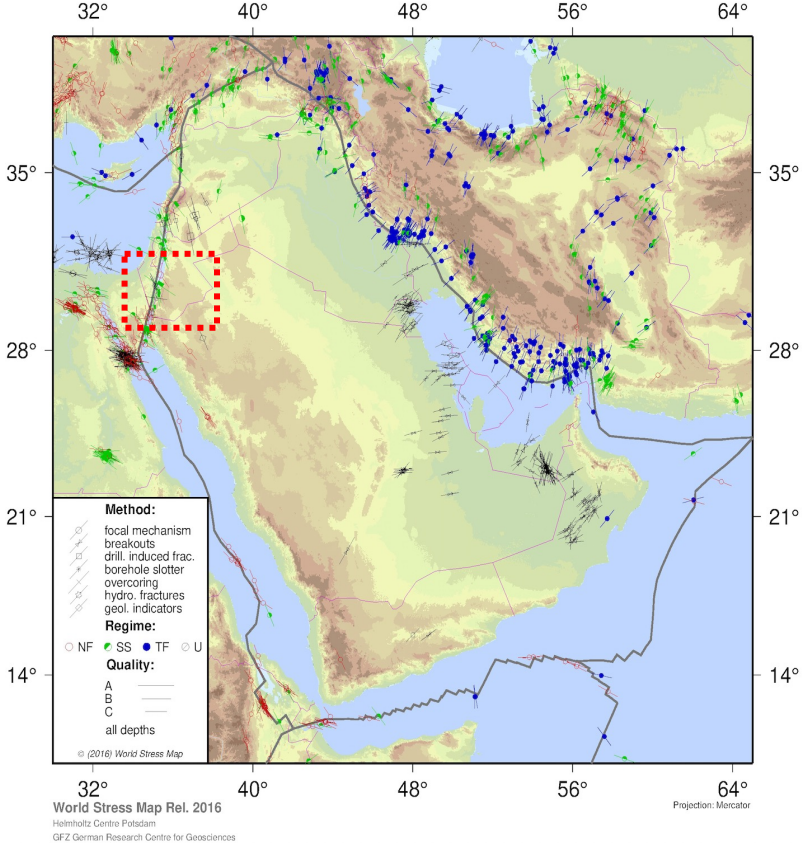

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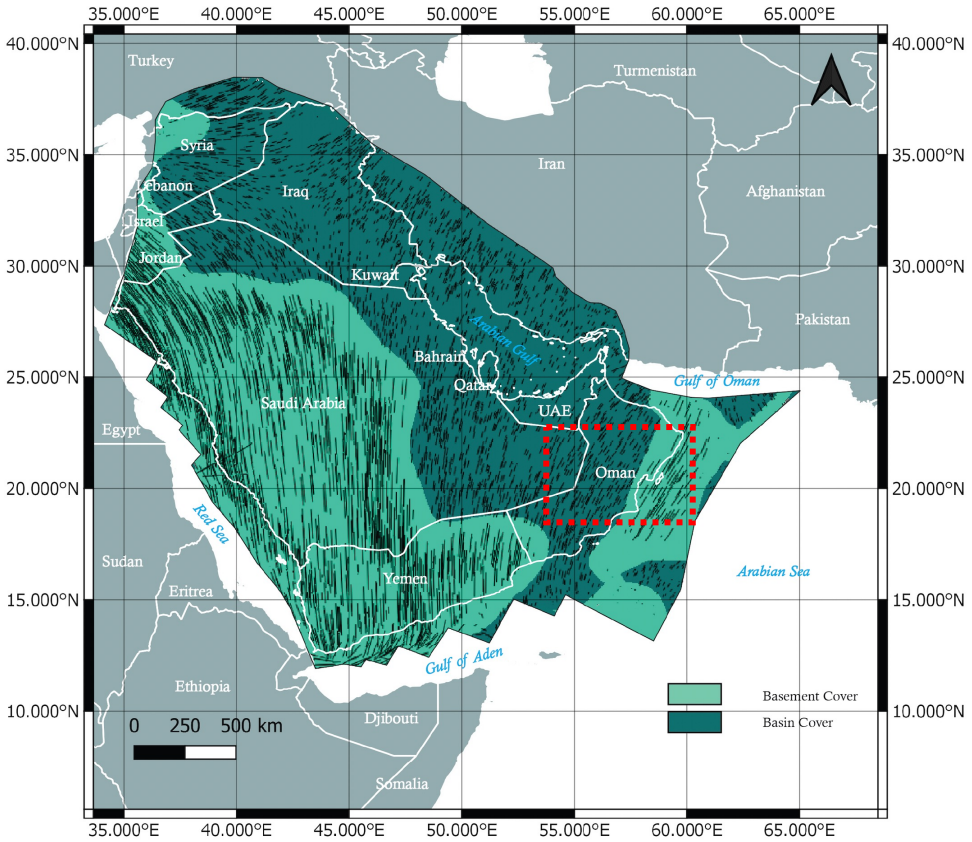

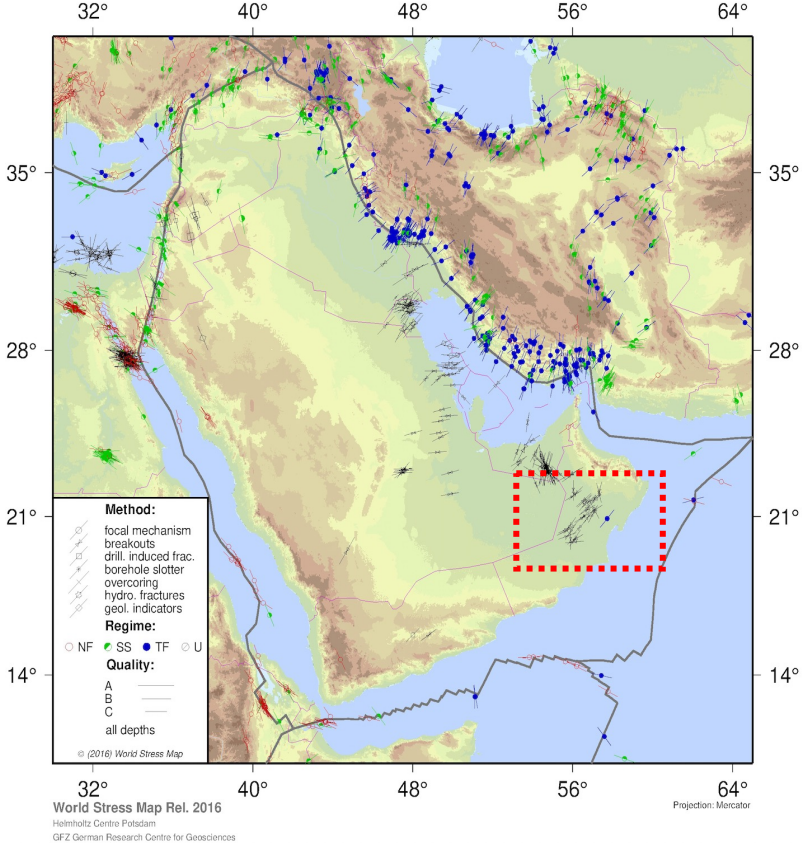

4. Conclusions

- Recently published plate velocity models in conjunction with finite element methods help to estimate present-day deformation and in-situ stresses on the Arabian plate.
- Our subsurface model considers updated basement and MOHO depth maps.
- We use an unstructured FE mesh with finer resolution at critical locations.
- Our simulation results are in good agreement with published data.