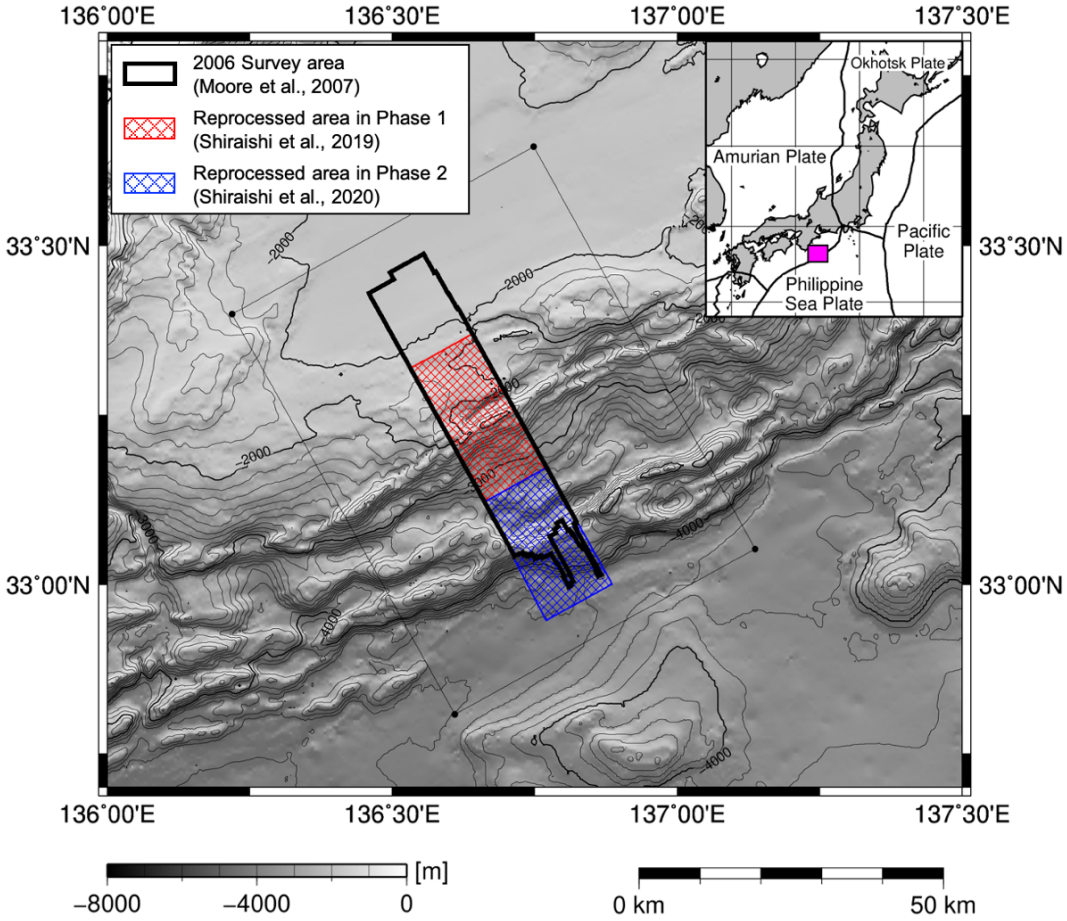
5 June 2020

Overview of "Kumano 3D MCS Reprocessed PSTM and PSDM Volumes"

For better understanding of geological structures in the Nankai Trough seismogenic zone off Kumano, southwest Japan, we produced new reflection profiles in 2015 - 2016 (Phase 1) and 2017 - 2018 (Phase 2) by reprocessing the legacy 3D seismic data acquired in 2006. The available reprocessed data include 3D volumes of pre-stack time migration in Phase 1, pre-stack depth migration in Phase 1 and 2, and velocity models.
Please submit a request form on the last page to dmo@jamstec.go.jp via email after reading this general information about the available data.

1. Location map



2. Imaged grid definition

- CMP Bin definition
  - Map projection: Universal Transverse Mercator (UTM) zone 53
  - In-line (IL) bin size: 18.75 m (SW-NE)
  - X-line (XL) bin size: 12.5 m (SE-NW)
  - Corner points (black dots in the location map)
    - Corner 1: (650713.64, 3631130.33) at (IL 1002, XL 2500)
    - Corner 2: (613355.02, 3696163.66) at (IL 1002, XL 8500)
    - Corner 3: (662128.63, 3724185.05) at (IL 4002, XL 8500)
    - Corner 4: (699487.24, 3659151.72) at (IL 4002, XL 2500)
  - Azimuth: 330 degrees

- Reprocessed range

  # Phase 1 in 2015-2016 (Preprocessing, PSTM and PSDM)

  - Pre-stack Time Migration (PSTM)

    - IL: 2080 – 2850

- XL: 4750 - 6750
- Time range: 0 - 11,200 ms (Sampling Interval: 4 ms)

- Pre-stack Depth Migration (PSDM)
  - IL: 2100 – 2760
  - XL: 4750 – 6750
  - Depth range: 0 - 13,000 m (Sampling interval: 4 m)

 # Phase 2 in 2017-2018 (Preprocessing and PSDM)

- Pre-stack Depth Migration (PSDM)
  Reprocessed volume in Phase 2
  - IL: 2100 – 2760
  - XL: 3000 – 4750
  - Depth range: 0 - 13,000 m (Sampling interval: 4 m)

  Final volume merged from Phase 1 & 2
  - IL: 2100 – 2760
  - XL: 3000 – 6750
  - Depth range: 0 - 13,000 m (Sampling interval: 4 m)

3. Processing workflow

< Pre-processing >

- Navigation Merge to 37.5m x 6.25m grid
- Low Cut Filter
- Swell Noise Attenuation
- Optimized Designature and Full Deghosting
- Gun and Cable Statics
- Linear Noise Attenuation (LNA) in Tau-P domain
- Surface Related Multiple Elimination (SRME)
- Shot and Channel Consistent Amplitude Compensation
- Tidal Statics
- 2nd Order Velocity Analysis 1km x 1km
- Regrid to 18.75m x 12.5m
- Spatial Anti Alias K Filter Followed by Adjacent Trace Drop to 12.5 m
- High Resolution Parabolic Radon Demultiple in 2DCDP Gathers (Phase 1)
- 4D Interpolation and regularization
- Spherical Divergence Application
- Multiple Diffraction Removal application
- High Resolution Parabolic Radon Demultiple in 3DCDP Gathers
- Q Compensation
- Stack Optimized Residual Multiple Attenuation (Phase 1)
- Premigration Offset Plane Denoise

< Pre-Stack Time Migration (PSTM) >

- High density velocity analysis with Eta
- VTI Pre-Stack Time Migration
- Post-Migration Radon Demultiple
- Post-Migration Denoise
- Q compensation (amplitude)
- Angle mute (Near: 0 - 25, Mid: 25 - 45, Far: 45 - 60 degrees)
- Time variant filter
- Time variant gain
- Final PSTM stack (full angle stack)

< Velocity Model Building (VMB) for PSDM>

- Split gathers into two azimuth sectors

- Initial model from smoothed 2006 PSDM velocity
- Isotropic velocity model update
- Initial TTI anisotropic velocity model
- TTI anisotropic velocity model update
  (5 updates in phase 1, and 4 updates in Phase 2)
- Epsilon Update

< Pre-Stack Depth Migration (PSDM) >

- Beam/Kirchhoff TTI Pre-Stack Depth Migration
- Depth to Time conversion
- Residual Moveout (RMO) correction
- Post-migration Radon demultiple
- Additional denoise on common image gathers
- Angle mute and stack (Full: 4 - 35, Near: 4 - 20, Mid: 15 – 30, Far: 25 - 50 degrees)
- Post-Stack denoise
- Q compensation (amplitude)
- Time variant filter
- Time variant gain
- Time to Depth conversion

4. Available data

- Data format: SEGY (rev.1)

  The SEGY file format is one of several data standards developed by the Society of Exploration Geophysicists (SEG) for the exchange of geophysical data.

- Available via internet download [**87.5 GB**]

  Pre-Stack Time Migration (PSTM) volumes (Phase-1 only)
  - Final PSTM Stack [**17.7 GB**]
  - RMS velocity for PSTM [**91 MB**]

  Pre-Stack Depth Migration (PSDM) volumes (Merged volumes from Phase-1 & Phase-2)
  - Final Beam PSDM Stack [**28.9 GB**]
  - Final Kirchhoff PSDM Stack [**28.9 GB**]
  - Velocity model for PSDM [**11.9 GB**]

- Available via HDD copy [**3.48 TB**]

  (All costs for purchasing and shipping HDDs should be borne by requesters.)

  Processed gathers
  - Preprocessed pre-migration gathers [**16 files (phase 1) + 14 files (phase 2), 645 GB in total**]
  - Final PSTM gathers [**16 files (phase 1), 530 GB in total**]
  - Final Beam PSDM gathers [**12 files (phase 1) + 12 files (phase 2), 1002 GB in total**]
  - Final Kirchhoff PSDM gathers [**12 files (phase 1) + 12 files (phase 2), 1002 GB in total**]

  Other PSTM gathers, stacks, and models (Phase 1 only)
  - PSTM angle mute stack (near, middle, far, full) [**4files, 70.6 GB**]
  - Interval velocity converted from RMS velocity for PSTM [**91 MB**]
  - Eta model for VTI-PSTM [**91 MB**]

  Other PSDM gathers, stacks, and models (Phase 1 + Phase 2)
  - Beam PSDM angle mute stack (near, middle, far) [**3 files, 86.6 GB in total**]
  - Kirchhoff PSDM angle mute stack (near, middle, far) [**3 files, 86.6 GB in total**]
  - Delta model for TTI-PSDM [**11.9 GB**]
  - Epsilon model for TTI-PSDM [**11.9 GB**]
  - Slope-X model for TTI-PSDM [**11.9 GB**]
  - Slope-Y model for TTI-PSDM [**11.9 GB**]

- Depth-to-time conversion velocity [**11.9 GB**]
- RMO stacking velocity model [**5.4 GB**]

5. Funding

The reprocessing project was supported by joint funds:

- Japan Society for the Promotion of Science (JSPS) KAKENHI (JP15H05717)
- Management expense grants of R&D center for Ocean Drilling Science (ODS) and Center for Deep Earth Exploration (CDEX) in Japan Agency for Marine-Earth Science and Technology (JAMSTEC) provided by Ministry of Education, Culture, Sports, Science, and Technology (MEXT)

6. References

Moore, G.F., Bangs, N.L., Taira, A., Kuramoto, S., Pangborn, E., Tobin, H.J. (2007). Three-dimensional splay fault geometry and implications for tsunami generation. *Science*, 318, 1128–1131. https://doi.org/10.1126/science.1147195

Shiraishi K., Moore G.F., Yamada Y., Kinoshita M., Sanada Y., Kimura G. (2019). Seismogenic zone structures revealed by improved 3-D seismic images in the Nankai Trough off Kumano, *Geochemistry, Geophysics, Geosystems*, 20, 2252-2271. https://doi.org/10.1029/2018GC008173

Shiraishi K., Yamada Y., Nakano M., Kinoshita M., Kimura G. (2020). Three-dimensional topographic relief of the oceanic crust may control the occurrence of shallow very-low-frequency earthquakes in the Nankai Trough off Kumano, *Earth, Planets, and Space*, 72:72. https://doi.org/10.1186/s40623-020-01204-3

Data request of "Kumano 3D MCS Reprocessed PSTM and PSDM volumes"

Date:

Name of requester(s):

Affiliation(s):

Contact address:
- Email address (required)

- Shipping address (optional)

Purpose of use:

List of requesting data: Please check or fill the checkboxes (☐) of the following dataset list.

- Available **via internet download [87.5 GB]**

  Pre-Stack Time Migration (PSTM) volumes (Phase 1 only)
  - ☐ Final PSTM Stack [**17.7 GB**]
  - ☐ RMS velocity for PSTM [**91 MB**]

  Pre-Stack Depth Migration (PSDM) volumes (Phase 1 + Phase 2)
  - ☐ Final Beam PSDM Stack [**28.9 GB**]
  - ☐ Final Kirchhoff PSDM Stack [**28.9 GB**]
  - ☐ Velocity model for PSDM [**11.9 GB**]

- Available **via HDD copy [3.48 TB]**

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  Other PSTM/PSDM volumes and models
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  - ☐ Depth-to-time conversion velocity [**11.9 GB**]
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