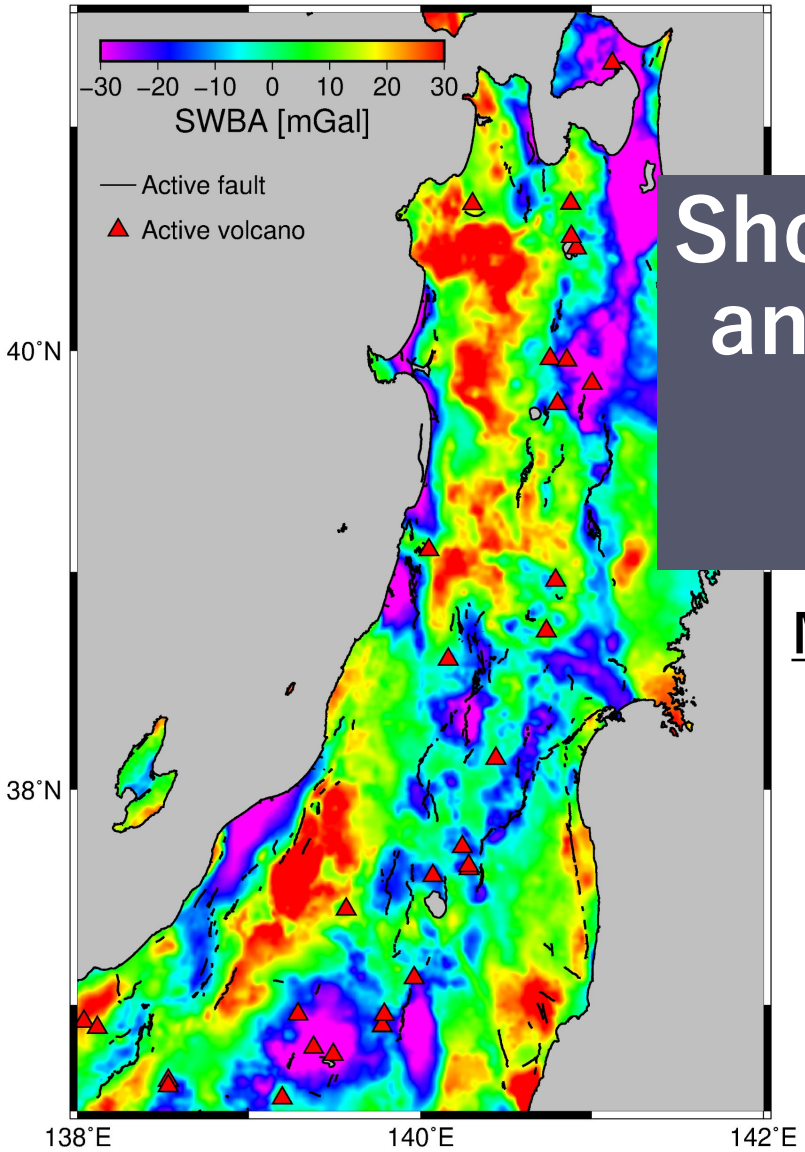
G4.3 EGU22-3409



Short-wavelength Bouguer anomaly and folding with disclination in the northeastern Japan

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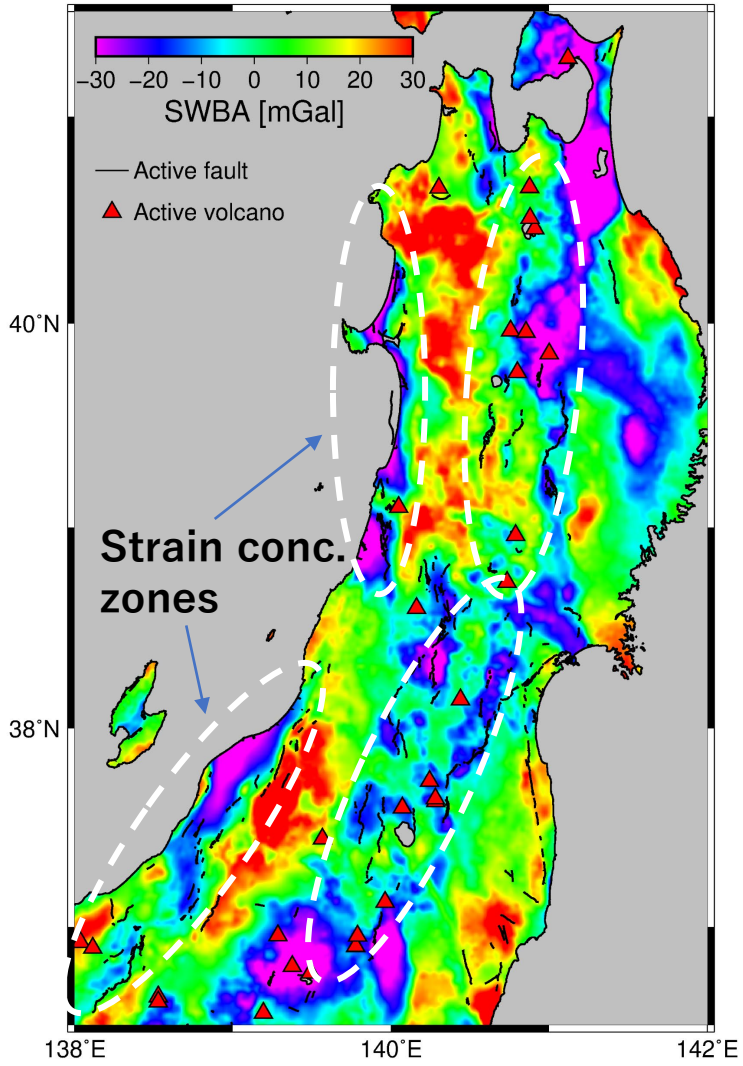
Hirano et al. (2022), *Terra Nova*, doi:10.1111/ter.12560

Short-wavelength Bouguer anomaly (SWBA) in the northeastern Japan



Hirano et al. (2022)

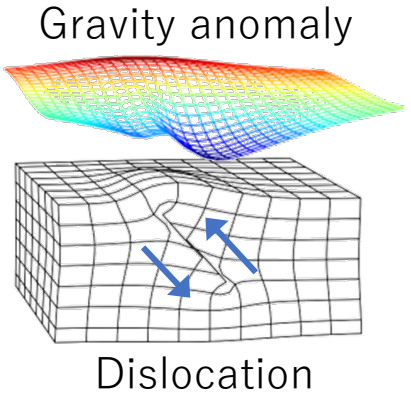
■**Trend of active faults:** negative regions

■**Its cause & Estimated anomaly:**

Cracks & volumetric strain due to fault dislocation

▼

About -10 mGal for 3 million years



■**Patterns**

Strain concentration zones with active faults and multi folding

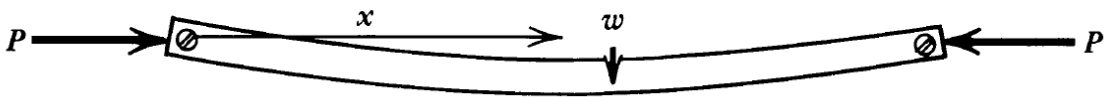
▶Negative zones along the arc

■**Objective:**

Discuss the SWBA from the geometrical viewpoint of folding with disclination

Folding and Euler-Schouten curvature

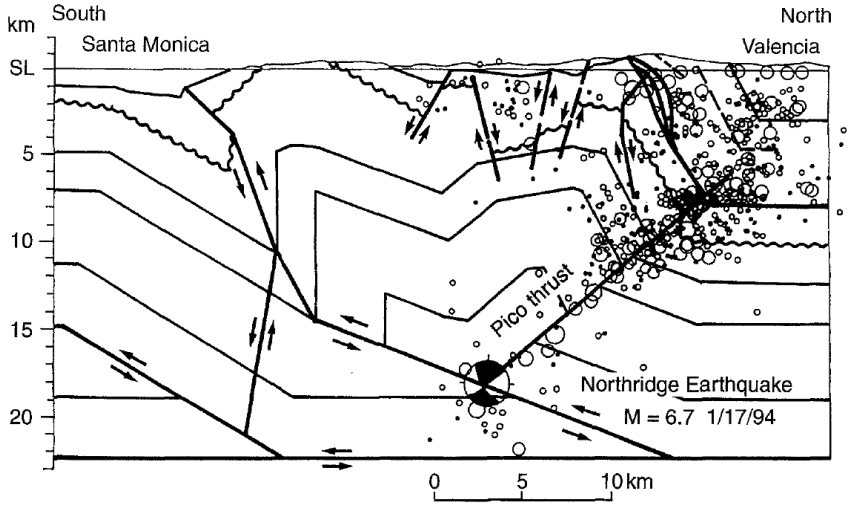
■Euler-Schouten curvature (Schouten, 1954): $H_{ij}^{\alpha} \approx \frac{\partial w^{\alpha}}{\partial x^{i} \partial j}$ (w: deflection)



(Turcotte & Schubert, 2014)

In the case, $H \approx \frac{\partial^2 w}{\partial x^2}$

■Folding and fault dislocation



(Davis & Namson,1994; Nagahama, 1996)

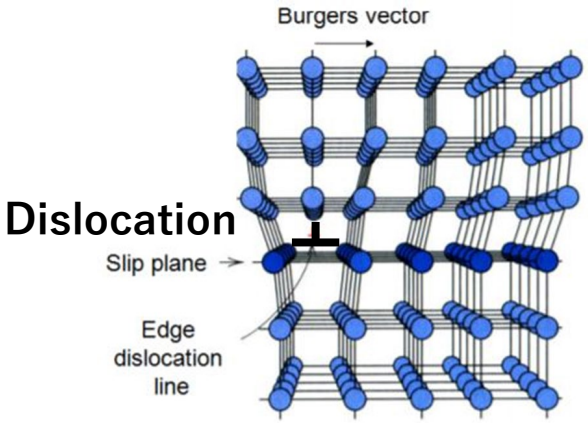
The density of earthquake occurrence N is proportional to the curvature of folding, (Nagumo, 1969)

$$N \propto \left| \frac{\partial^2 w}{\partial x^2} \right|$$

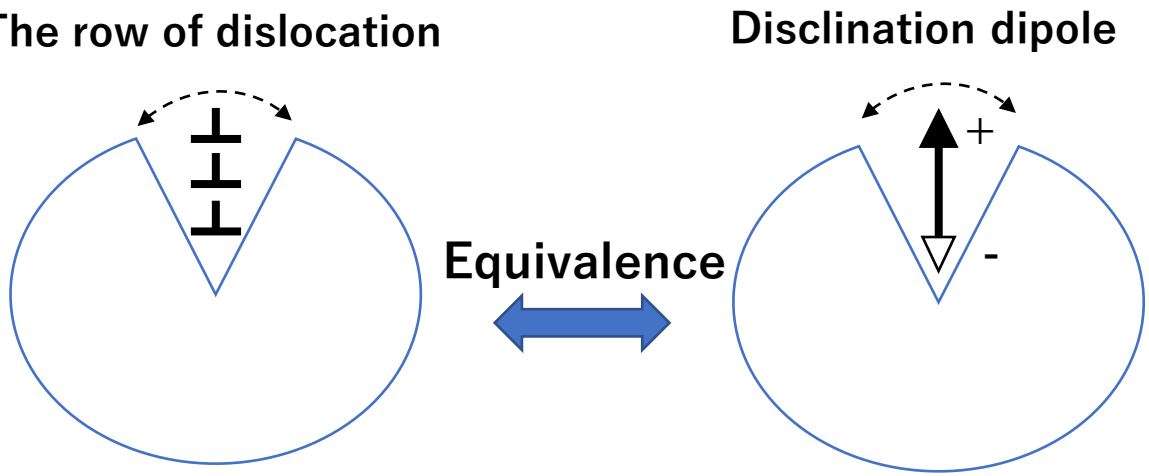
Fault dislocation accumulates at the regions with its high curvature (Nagahama, 1996).

Disclination and Curvature in material space

The Equivalence between dislocation and disclination (Kleinert, 2011)



(Kobasi & Takada,2016)



Disclination and curvature in material space (Kondo, 1955)

- **Disclination density**

$$\theta^{\alpha\beta} = \epsilon^{\alpha\nu\mu}\epsilon^{\beta\lambda\kappa}R_{\nu\mu\lambda\kappa}/4$$

($\epsilon^{\alpha\nu\mu}$: Levi-Civita symbol)

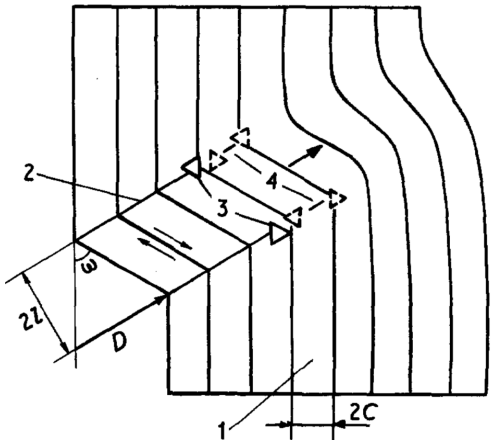
- **Riemann-Christoffel curvature (Gauss-Codazzi relation):**

$$R_{\nu\mu\lambda\kappa} = \frac{1}{2}\Sigma_{\alpha}(H_{\mu\kappa}^{\alpha}H_{\nu\lambda}^{\alpha} - H_{\nu\kappa}^{\alpha}H_{\mu\lambda}^{\alpha})$$

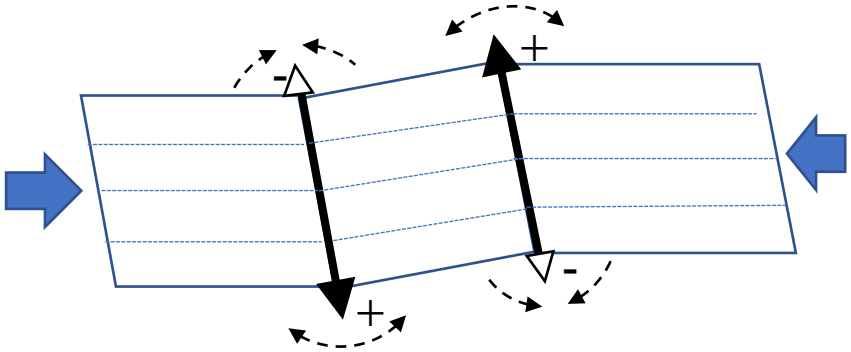
Euler-Schouten curvature

Kink folding and Disclination

■Kink band and Kink folding (Pertsev et al.,1981;Osaki et al., 2011)

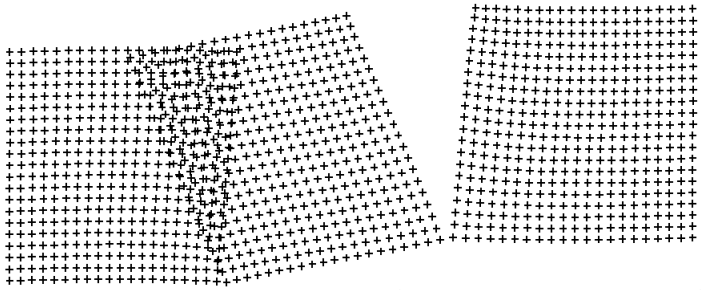


The Structures in non-homogeneous material with disclination dipoles



Angular folding with disclination dipoles

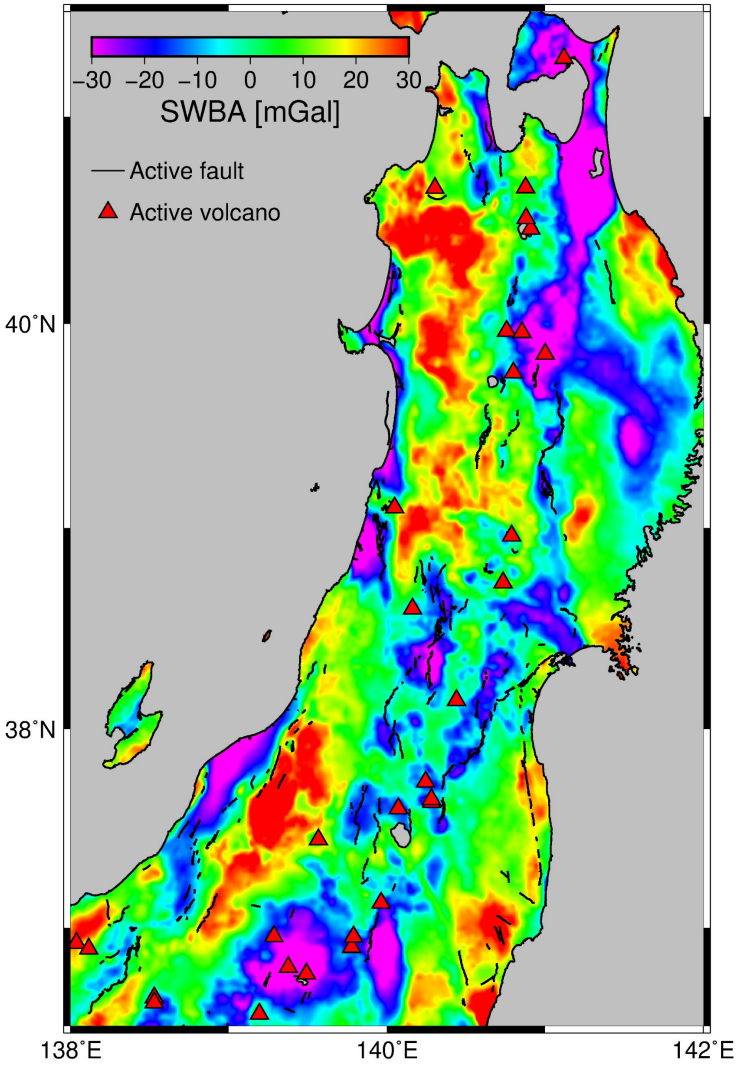
■ Displacement field with two disclination dipoles (Osaki et al., 2011)

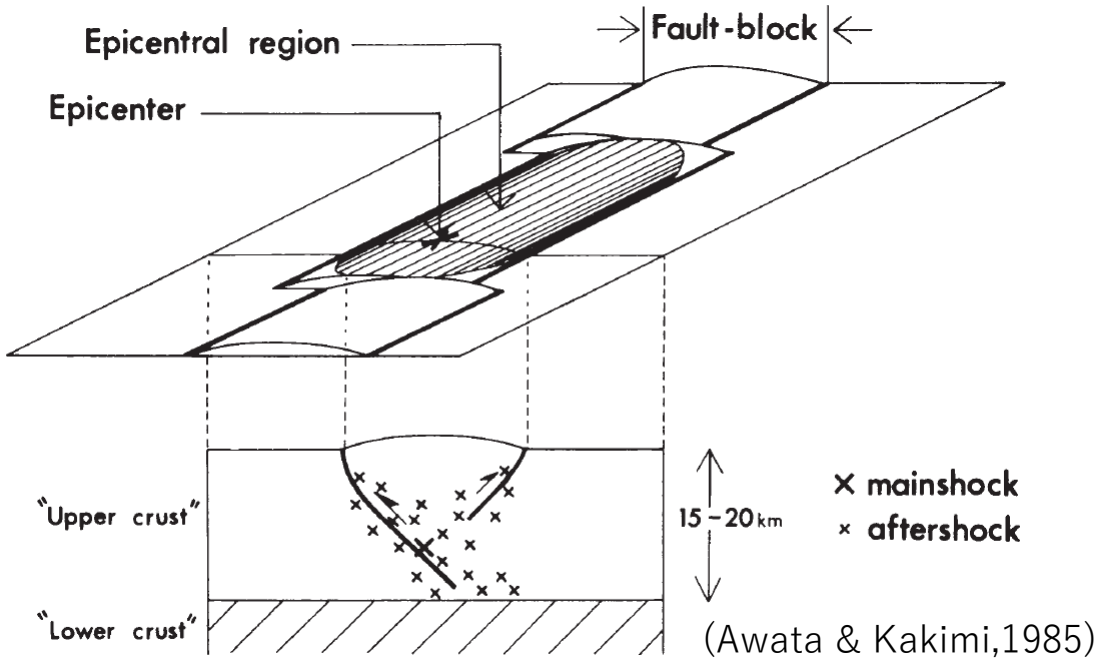


(Osaki et al., 2011)

Mass-loss or mass-excess zones around disclination

Fault blocks can cause the positive and negative regions





(Awata & Kakimi,1985)

Fault blocks can cause the mass-loss or mass-excess regions as well as Kink folding.

■Conclusion

The positive and negative zones along the arc reflect the geometric condition of the crust with disclination.