Representation Theorem and Green's Function (3) -- Strain, Stress, and Density Perturbation Fields due to a Point Source Using 2nd Derivative of Green's Function in an Unbounded Homogeneous Isotropic Elastic Medium --

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Here we derive the second spatial derivative of Green's fuction in an unbounded homogeneous isotropic elastic medium. Following this formula, we obtain the expressions for strain, stress, and density perturbation fields due to a point source described by a moment tensor or a single force. These fomulae are useful for theoretical modeling of the prompt detection of earthquake occurrences by means of piezoelectricity, piezomagneticity, and transient gravity perturbations. We propose two applications of the formulae: (1) volumetric moment tensor mass redistribution and (2) dynamically induced quadratic earthquake mass redistribution. Regarding the latter application, we show the relationship between the moment magnitude M_w of an earthquake and dynamically induced quadratic earthquake mass redistribution (Table 1).

Table 1. The relationship between M_w of an earthquake and dynamically induced quadratic earthquake mass redistribution.

Reference: M. Kimura and N. Kame, 2018, Representation Theorem and Green's Function (3) -- Strain, Stress, and Density Perturbation Fields due to a Point Source Using 2nd Derivative of Green's Function in an Unbounded Homogeneous Isotropic Elastic Medium --, Zisin 2, 71, 153-160, doi:10.4294/zisin.2017-20

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M_w	$\delta m^{DQM}(M_w) = 10^{1.5M_w+1}$[kg]
1.0	$10^{2.5} \sim 3 \times 10^2$
2.0	$10^{4.0} \sim 1 \times 10^4$
3.0	$10^{5.5} \sim 3 \times 10^5$
4.0	$10^{7.0} \sim 1 \times 10^7$
5.0	$10^{8.5} \sim 3 \times 10^8$
6.0	$10^{10.0} \sim 1 \times 10^{10}$
7.0	$10^{11.5} \sim 3 \times 10^{11}$
8.0	$10^{13.0} \sim 1 \times 10^{13}$
9.0	$10^{14.5} \sim 3 \times 10^{14}$