

2019年5月28日(火)

[J] Eveningポスター発表 | セッション記号 A (大気水圏科学) : A-OS 海洋科学・海洋環境

17:15 ~ 18:30 | ポスター会場 幕張メッセ国際展示場 8ホール_8

[A-OS18] 海洋物理学一般

コンビーナ:川合 義美(国立研究開発法人海洋研究開発機構 地球環境観測研究開発センター)、東塚 知己(東京大学大学院理学系研究科地球惑星科学専攻)、北出 裕二郎(東京海洋大学大学院海洋科学技術研究科)

[AOS18-P01] Mathematical modeling for initial profile of tsunami by instantaneous- or slow-faulting

*Chi-Min Liu¹ (1.Chienkuo Technology University)

[AOS18-P02] 衛星重力観測と衛星海面高度計から見る2004年スマトラアンダマン地震と2012年インド洋地震に伴うジオイド高変化と海面高度変化

★招待講演

*田中 優作¹ (1.東京大学地震研究所)

[AOS18-P03] An irregularly shaped warm eddy observed by Chinese underwater gliders

*Huabin MAO¹ (1.South China Sea Institute of Oceanology)

[AOS18-P04] sea surface cooling in the northern South China Sea observed using Chinese underwater glider

*Chunhua Qiu¹ (1.Sun Yat-sen University)

[AOS18-P05] Airborne SAR observation of dependence of ocean surface backscattering on wind direction

*灘井 章嗣¹ (1.情報通信研究機構)

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本セッションは、海洋物理学に関する幅広い研究テーマについて、様々な観点から発表・議論・情報交換を行う場としたい。理論研究・観測データ解析・数値モデリングなど幅広い研究手法からの発表を歓迎する。

[AOS18-P01] Mathematical modeling for initial profile of tsunami by instantaneous- or slow-faulting

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Mathematical modeling for initial profile of tsunami by instantaneous- or slow-faulting

*Chi-Min Liu¹

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Tsunami is one of the most catastrophic disasters in the world. Most of them are generated by the faultings. As the faulting speed is of several thousand meters per second, many tsunamis are generated instantaneously and therefore their initial profiles are assumed to be identical to the profiles of the uplifted sea bottom. This assumption is often adopted in numerical simulation for the sake of simplification. However, in some faulting cases, the speed is comparatively slow which results in the profile discrepancy between sea bottom and surface. To this end, present study aims to mathematically analyze the initial wave profiles generated by either the instantaneous or slow faulting. Results show that the initial profiles greatly differ from the variation of sea bottom for the slow-faulting scenarios.

Keywords: tsunami, slow-faulting, initial profile

衛星重力観測と衛星海面高度計から見る2004年スマトラアンダマン地震と2012年インド洋地震に伴うジオイド高変化と海水面高度変化

Geoid height and sea surface changes due to the 2004 Sumatra-Andaman earthquake and the 2012 Indian-Ocean earthquake from satellite gravimetry and satellite altimetry

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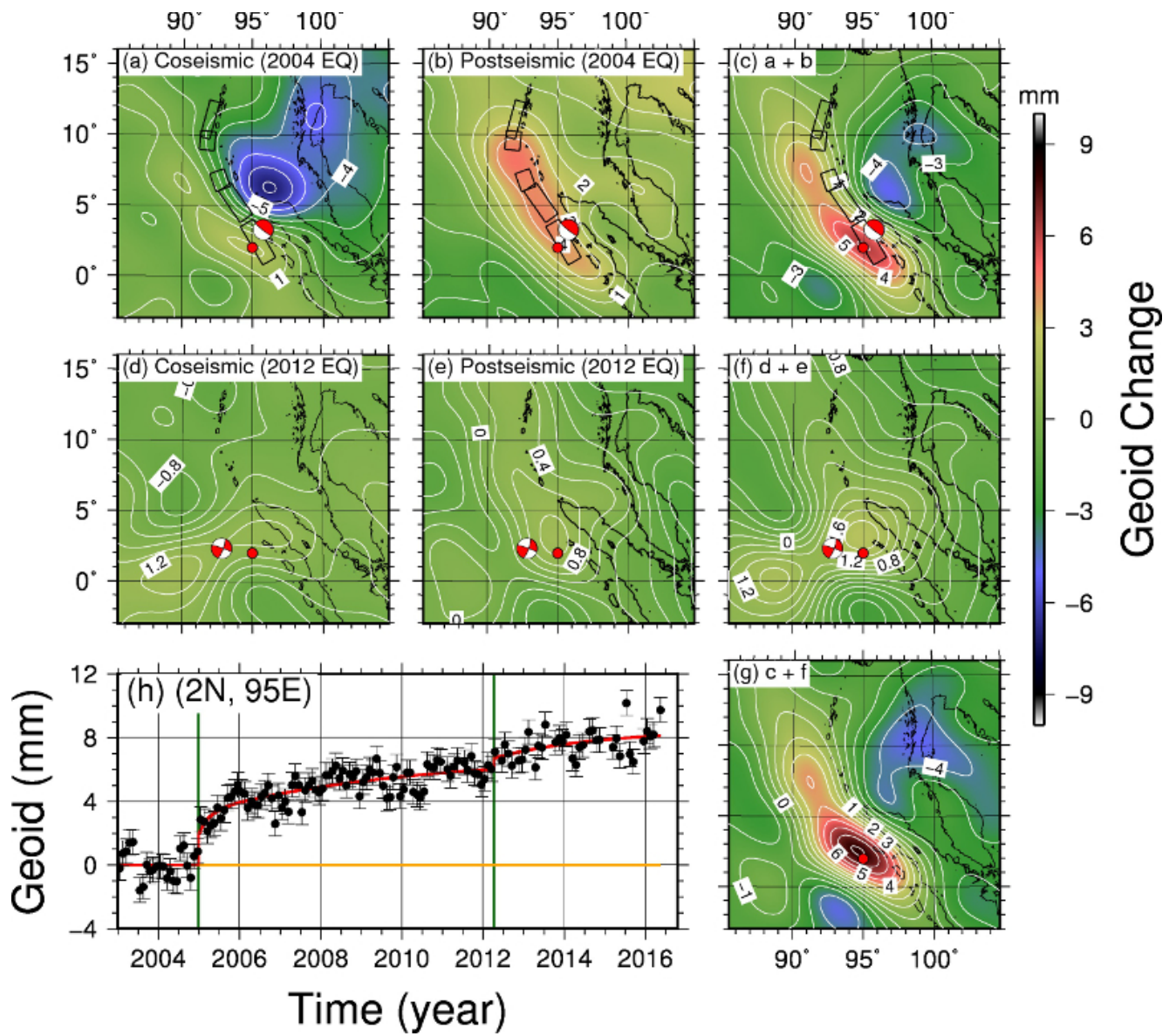
2004年と2012年にスマトラで発生した巨大地震が、海域における局所的かつ不可逆的なジオイド高変化をもたらした。これについて、海域のジオイド高と海水面高度の変化に注目した研究結果が、2019年2月18日現在、TAO誌に受理され印刷中である。本講演では、この内容について紹介したい。以下は、当該論文の概要と、図の説明である。

重力観測衛星GRACEのデータの解析によって、2004年スマトラアンダマン地震(Mw9.2)及び2012年インド洋地震(Mw8.6)が引き起こした、地震時と地震後の長期的な地球重力場とジオイド高の変動を捉えた。その結果、地震現象が循環的に発生する事とは逆に、重力場とジオイド高が不可逆的に変化した事が示された。この重力場とジオイド高変化は海域において発生しているため、次に、そこから予測される海面高変化の検出を衛星海面高度計のデータを用いて試みた。最小二乗法やEOF解析を利用した海面高変化の時系列解析を行った結果、ジオイド高変化に一致する海面高変化は、衛星海面高度計のデータにおいてはエルニーニョ等に起因する熱膨張の寄与にほぼ埋没しており、stericな海水の移動とnon-stericな海水の移動が、データの取得方法によって別個に得られる事が定量的に示された。

[図] GRACE衛星が観測した2004年スマトラアンダマン地震(Mw9.2)と2012年インド洋地震(Mw8.6)に起因する不可逆的なジオイド高変化。空間分解能は300km程度である。(a): 2004年スマトラアンダマン地震の本震に伴うジオイド高変化。図中の黒い四角は断層を模式的に表したもので、赤と白のビーチボールは断層のメカニズムを示し、その位置は震央を示す。(b): 2004年スマトラアンダマン地震の直後から現在2016年5月までに進行した、粘弾性緩和に起因すると考えられる地震後のジオイド高変化。(c): (a)と(b)の和。(d): 2012年インド洋地震の本震に伴うジオイド高変化。(e): 2012年インド洋地震の直後から現在2016年3月までに進行した、粘弾性緩和に起因すると考えられる地震後のジオイド高変化。(f): (d)と(e)の和。(g): (c)と(f)の和。(h): 地図上に赤丸で示した点の時系列(季節変化は補正済み)。地震発生前の平均値を0に設定しており、この値をオレンジの水平線で示している。黒丸が観測データで、赤は最小二乗法で観測データにフィッティングした曲線である。ダークグリーンの本線の二本の鉛直線は2004年と2012年の地震発生時を示している。

キーワード：ジオイド高変化、海面高変化、衛星重力観測、衛星海面高度計、地震

Keywords: Geoid height change, Sea level variation, Satellite gravimetry (GRACE), Satellite altimetry (Jason), earthquake



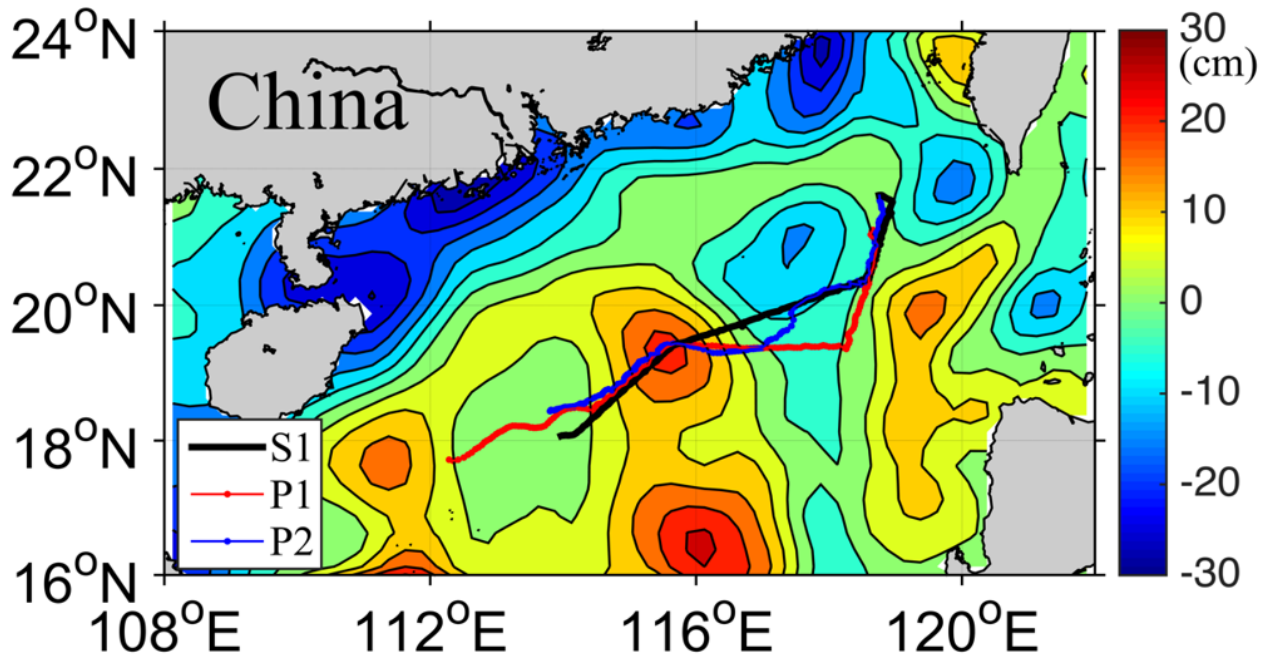
An irregularly shaped warm eddy observed by Chinese underwater gliders

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Mesoscale eddies are important for transporting oceanic energy and matter. We investigated the three-dimensional structure of an irregularly shaped warm eddy using three Chinese underwater gliders and satellite data during May 2015 in the northern South China Sea. The warm eddy lasted for 2 months, remained quasi-steady, and had a mean radius of ~70 km from May 10 to May 31. The heat contents observed along the two glider tracks differed markedly, by 2×10^9 J/m², which reflected an imbalance in the geostrophic and tangential velocity distributions of the eddy. The geostrophic/tangential velocity decreased/increased with depth within the warm eddy. The maximum tangential velocities calculated using the datasets from the two gliders were 0.8 and 0.25 m/s, respectively, confirming that the shape of the warm eddy was horizontally asymmetrical. Large errors can arise when the heat, energy, and matter transport for an irregularly shaped eddy are estimated using a regular circular model. We suggest that more intersecting glider tracks should be used to retrieve the three-dimensional eddy structure, and that those tracks should be better designed. The irregular shape of the warm eddy was likely induced by oceanic currents such as the wind-induced Ekman current. Further study is needed to elucidate the eddy-current interactions and the mechanisms thereof.

Keywords: Irregular shape, Warm eddy, Chinese underwater glider



sea surface cooling in the northern South China Sea observed using Chinese underwater glider

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Based on 26 days of Chinese Sea-wing underwater glider and satellite microwave data, we documented cooling of the upper mixed layer in response to changes in the wind in 9.19-10.15, 2014. The sea-wing underwater glider measured 177 profiles of temperature, salinity, and pressure. we estimated temperature tendencies using a mixed layer model. The entrainment rate and latent heat flux were the two major components that regulated cooling of the mixed layer, and that the Ekman advection and sensible heat flux were small.

Keywords: mixed layer, glider, south china sea

Airborne SAR observation of dependence of ocean surface backscattering on wind direction

Airborne SAR observation of dependence of ocean surface backscattering on wind direction

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Synthetic aperture radar (SAR) has attracted attention as an oceanwinds measurement technique in coastal areas where high spatial resolution is required.

Oceanwinds measurement by SAR requires the normalized radar cross section (NRCS) model of ocean surface backscattering. However, the NRCS models currently developed is statistically analyzed by combination of NRCS measured by spaceborne SAR and meteorological data. In this study, by carrying out airborne SAR observations with multiple illumination directions in a short time, direct measurement of wind direction dependence of the NRCS at a certain wind speed was tried.

Using a model function of NRCS with the same format as the NRCS models, the coefficients of oceanwinds dependence of NRCS are determined by the airborne SAR. The results determined by airborne SAR are compared with NRCS models and results of the airborne scatterometer.

Regarding the wind speed dependence, the results of the airborne SAR showed good agreement with that of the airborne scatterometer. On the other hand, two NRCS models give a fairly large NRCS. In addition, the change of wind speed dependence with incidence angle determined by the airborne SAR and the airborne scatterometer show different tendency with those of NRCS models.

Regarding the wind direction dependence, the results by airborne SAR shows significantly large wind direction dependence compared with the NRCS model at the incidence angle of 32 degrees. On the other hand, the wind direction dependence by the airborne SAR almost agrees with that of the airborne scatterometer at the incidence angle of 32 degrees.

Comparing the measured NRCS by the airborne SAR with that by the airborne scatterometer, the possibility of influence of the observation configuration on measurement accuracy of the wind direction dependence is suggested.

In addition, the influence of size of spatial averaging may be important on the accuracy of oceanwinds measurement using SAR. Though the high spatial resolution oceanwinds measurement is expected for SAR, ocean surface phenomena like swells and ship wakes may influence the oceanwinds measurement by SAR. Moreover, SAR data cannot be free from speckle noise. The influence of spatial averaging size has to be grasped.

キーワード：海上風、合成開口レーダー、海面後方散乱、正規化レーダ散乱断面積

Keywords: Oceanwinds, Synthetic aperture radar, Ocean surface backscattering, Normalized radar cross section