Similarities and differences between the Kuroshio Extension and a baroclinic jet in a channel

*中野 英之[1]、辻野 博之[1]
*Hideyuki Nakano[1], Hiroyuki Tsujino[1]

1. 気象研究所
1. Meteorological Research Institute

There are many similarity in PV structure between the Kuroshio Extension (KE) and a baroclinic jet in a channel (hereafter, just a baroclinic jet). PV along the front has a sharp contrast in the upper layer and nearly homogeneous in the lower layer. For the baroclinic jet, it is proposed that PV contrast is generated due to the suppressed mixing across the front and vigorous mixing at their flanks, resulting in the formation of a eastward narrow jet. Despite the distribution similarity, it is difficult to apply the proposed mechanism directly to the formation of the KE. The PV contrast along the KE is the strongest at the separation and disappears into the interior Sverdrup region, suggesting that its primary source is from the western boundary rather than the barrier effect along the fronts. In fact, eddies reduce the PV contrast in the upstream part of the KE. In addition, the barrier effect is not so simple for the Kuroshio Extension. The KE is a blender for Kuroshio-origin water, whereas it is a barrier for other water masses in the upper layer. From these fact, it seems that the formation and maintenance of the Kuroshio Extension seems essentially different from those of the baroclinic jet. Some diagnostic approaches will be also discussed.

キーワード：黒潮続流、傾圧ジェット
Keywords: Kuroshio Extension, baroclinic jets

漂流ブイで観測された北太平洋移行領域の流動構造
Structure of the Transition Domain observed with drifting buoys

*西川 はつみ[1]、三寺 史夫[1]、奥西 武[2]、伊藤 進一[3]、和川 拓[4]、長谷川 大介[2]、美山 透[5]、金子 仁[2]
*Hatsumi Nishikawa[1], Humio Mitsudera[1], Takeshi Okunishi[2], Shin-ichi Ito[3], Taku Wagawa[4], DAISUKE HASEGAWA[2], Toru Miyama[5], Hitoshi Kaneko[2]

1. 北海道大学低温科学研究所、2. 国立研究開発法人　水産研究・教育機構　東北区水産研究所、3. 東京大学大気海洋研究所、4. 国立研究開発法人　水産研究・教育機構　日本海区水産研究所、5. 国立研究開発法人海洋研究開発機構アプリケーションラボ
1. Institute of Low Temperature Science, Hokkaido University, 2. Tohoku National Fisheries Research Institute, Japan Fisheries Research and Education Agency, 3. Atmosphere and Ocean Research Institute, The University of Tokyo, 4. Japan Sea National Fisheries Research Institute, Japan Fisheries Research and Education Agency, 5. Japan Agency for Marine-Earth Science and Technology, Application Laboratory

北太平洋移行領域は亜熱帯と亜寒帯の海水交換が行われ，海洋学的・気象学的・生物学的に非常に重要な海域である。本研究では，漂流ブイ観測及び粒子追跡モデル (TRACMASS: Döös 1995, Blanke and Raynaud 1997) の解析結果から移行領域の流動構造や亜熱帯から亜寒帯への海水の輸送過程を明らかとする。

漂流ブイ観測は磯口ジェット (Isoguchi et al., 2006, Wagawa et al., 2014) 及び移行領域の流れの構造を可視化した。また，粒子追跡モデルから得られた粒子の軌跡の頻度分布は，海底地形に沿う流れと海底地形の谷を通過し亜寒帯へ入り込む流れを示しており，亜熱帯から亜寒帯への海水輸送経路が示唆された。

粒子の通りやすい高頻度分布領域は，42˚N –155˚E周辺にも確認できた。漂流ブイの軌跡もほぼ同じ場所で渦を描くような軌跡を示していた。この渦の原因として，42.5˚N –157˚Eに位置する小さな海底地形に伴う順圧流と海面付近での傾圧流が示唆された。この渦も，亜熱帯と亜寒帯の海水の交換に寄与している可能性がある。

キーワード：移行領域、磯口ジェット、漂流ブイ観測、海底地形
Keywords: transition domain, Isoguchi jet, drifting buoy observation, bottom topography

渦からの自発的な慣性重力波の放射とその反作用　～海洋のエネルギー収支の再考～

Generation and backreaction of spontaneously emitted inertia-gravity waves -An update of the ocean energy budget-

*杉本 憲彦[1]、Plougonven Riwal[2]
*Norihiko Sugimoto[1], Riwal Plougonven[2]

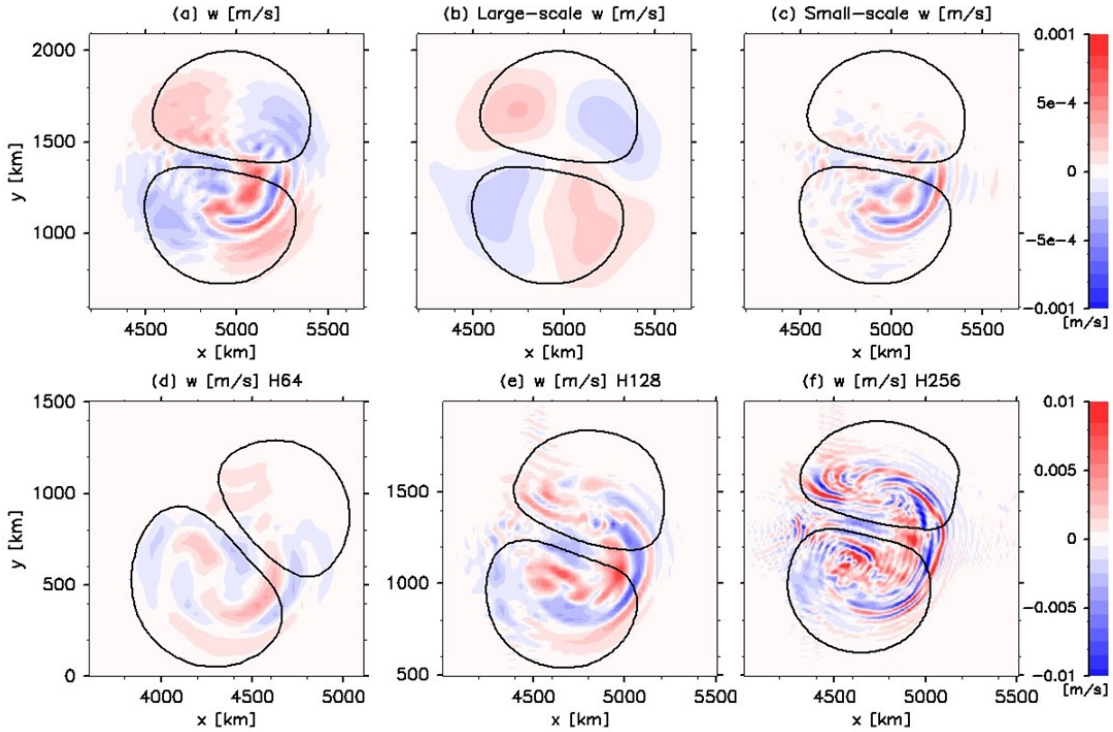
1. 慶應義塾大学　法学部　日吉物理学教室、2. École polytechnique, Laboratoire de Météorologie Dynamique
1. Keio University, Department of Physics, 2. École polytechnique, Laboratoire de Météorologie Dynamique

大気重力波（慣性重力波）は運動量を遠方まで輸送し, 中層大気の大循環を駆動する. 中層大気の大循環は物質輸送を通して, 気候に大きな影響を与える. このため, 重力波の励起, 伝播, 散逸の諸過程の解明は, 将来の気候変動予測の精度向上のためにも, 重要な研究課題の一つになっている.

ジェット気流等からの慣性重力波の放射は自発的な重力波放射過程と呼ばれる. 近年, ダイポールを用いた数値実験により, 放射過程についての理解が進展してきた. しかし, 重力波放射の反作用や解像度の依存性についての理解は十分でない.

本研究では, ダイポールからの重力波放射を再検討した. 重力波放射の反作用を調べるため, 長時間の数値実験を様々な水平解像度で行った. 重力波の振幅は水平解像度に比例し, 反作用はダイポールの運動エネルギーに現れた. 発表では, これまでの自発的放射の研究を簡単にレビューするとともに, 海洋のエネルギー収支の観点から中規模渦が自発的放射で失うエネルギーについての議論も行う.

キーワード：慣性重力波、自発的放射、反作用
Keywords: inertia-gravity wave, spontaneous emission, backreaction



Dynamics and Predictability of Downward Propagation of Stratospheric Planetary Waves Promoting Blocking Formation over the North Pacific: A Case study for March 2007

*向川 均[1]、野口 峻佑[2]、黒田 友二[2]、水田 亮[2]、小寺 邦彦[3]
*Hitoshi Mukougawa[1], Shunsuke Noguchi[2], Yuhji Kuroda[2], Ryo Mizuta[2], Kunihiko Kodera[3]

1. 京都大学、2. 気象研究所、3. 名古屋大学
1. Kyoto University, 2. Meteorological Research Institute, 3. Nagoya University

The atmospheric blocking is one of the most important circulation features in the troposphere causing anomalous weather in the extratropics. Recent theoretical studies have revealed that the blocking is basically maintained against dissipative processes through the selective absorption of synoptic anticyclones due to vortex-vortex interactions. On the other hand, its formation mechanism still remains controversial, but our recent observational studies indicate that downward propagating planetary waves from the stratosphere into the troposphere is a key to promote the blocking formation, especially over the North Pacific. However, the dynamics and predictability of the downward propagation of stratospheric planetary waves have not been revealed as yet.

In this study, predictability of a downward propagating event of planetary waves in the lower stratosphere observed in early March 2007 is examined by conducting ensemble forecasts using an AGCM. It is detected that the predictable period of this event is about 7 days. Regression analysis using all members of an ensemble forecast also reveals that the downward propagation is significantly related to an amplifying quasi-stationary planetary-scale anomaly with barotropic structure in polar regions of the upper stratosphere. Moreover, the anomaly is 90˚ out of phase with the ensemble mean field. Hence, the upper stratospheric anomaly determines the subsequent vertical propagating direction of incoming planetary waves from the troposphere by changing their vertical phase tilt, which depends on its polarity. Furthermore, the regressed anomaly is found to have similar horizontal structure to the pattern of greatest spread among members for predicted upper-stratospheric height field, and the spread growth rate becomes maximum prior to the occurrence of the downward propagation. Hence, we propose a working hypothesis that the regressed anomaly emerges due to the barotropic instability inherent to the upper stratospheric circulation.

In fact, the stability analysis for basic states comprised of the ensemble-mean forecasted upper-stratospheric streamfunction field using a non-divergent barotropic vorticity equation on a sphere supports our hypothesis. Thus, the barotropic instability inherent to the distorted polar vortex in the upper stratosphere forced by incoming planetary waves from the troposphere determines whether the planetary waves are eventually absorbed in the stratosphere or emitted downward into the troposphere.

キーワード：ブロッキング、惑星規模波、下方伝播
Keywords: blocking, planetary wave, downward propagation

Vortex-vortex interactions for the maintenance of atmospheric blocking: The selective absorption mechanism

*山崎 哲[1]
*Akira Yamazaki[1]

1. 海洋研究開発機構 アプリケーションラボ
1. Application Laboratory, Japan Agency for Marine-Earth Science and Technology

Atmospheric blocking is a quasi-stationary anticyclone with a radius of ~5000 km persisting for about 1 week or more, characterized by a pronounced meandering of the middle-latitude westerly jet stream. To clarify why blocking anomalously persists beyond the typical time scale of synoptic eddies has been an important issue for the blocking dynamics. In this stream, we proposed a new maintenance mechanism for atmospheric blocking, the selective absorption mechanism (SAM). According to this mechanism, which is based on vortex-vortex interactions (i.e., the interactions between a blocking anticyclone and synoptic eddies with the same polarity), a blocking anticyclone actively and selectively absorbs synoptic anticyclones (strictly, air parcels with low potential vorticity) from the storm-track regions in mid-latitudes. The blocking anticyclone, which is thus supplied with low potential vorticity of the synoptic anticyclones, can subsist for a prolonged period, withstanding dissipation. The SAM is one of the eddy-feedback mechanisms that describes the interaction between blocking and synoptic eddies with different time scales each other. At first, through the comparison with the famous maintenance mechanisms proposed in the previous studies, uniqueness and distinction of the SAM from other previously proposed maintenance mechanisms are discussed. And then, the SAM was verified in case studies and idealized numerical experiments.
In the case studies, trajectory analyses were conducted by using a reanalysis dataset provided by the Japan Meteorological Agency and the Central Research Institute of the Electric Power Industry. Ten actual cases of blocking were examined. Trajectories were calculated by tracing parcels originating from synoptic anticyclones and cyclones located upstream of the blocking. Parcels starting from anticyclones were attracted to and absorbed by the blocking anticyclone, whereas parcels from cyclones were repelled by the blocking anticyclone. The numerical experiments performed here were based on the nonlinear equivalent-barotropic potential vorticity equation, with varying conditions with respect to the shape and amplitude of blocking, the characteristics of storm tracks (displacement and strength), and the characteristics of background zonal flow. The experiments indicate that the SAM effectively maintains blocking, independently of the above conditions. The above results verify that the SAM is an effective general maintenance mechanism for blocking.

キーワード：大気ブロッキング、ストームトラック、渦位、対流圏界面、大気力学
Keywords: Atmospheric blocking, Storm tracks, Potential vorticity, Tropopause, Dynamical meteorology

準地衡擾乱に関する位相依存性のないエネルギー変換の定式化とその応用
Formulation and application of phase-independent evergy conversions for quasi-geostrophic eddies

*高谷 康太郎[1]
*Takaya Koutarou[1]

1. 京都産業大学
1. Kyoto Sangyo University

Estimating energy conversions could be useful to clarify dynamics of low-frequent variability of quasi-geostrophic disturbances. Energy conversion terms are composed of quadratic terms in disturbance amplitudes and shear terms of basic flows, so that they can mean energy conversions between disturbance fields and the basic flows. The quadratic terms in the energy conversions are usually expressed by the velocities of the disturbances, such as momentum transports u’v’, so that they inherently include an oscillatory component of one-half wave-length. Therefore, in traditional forms of the energy conversions, phase-averaging such as time-averaging should be needed to express energy-conversion distributions in the phase-independent forms.
In this study, a new formulation of energy conversions for quasi-geostrophic eddies is proposed under an assumption that a eddy is almost a plane wave in the WKB sense. Because of a phase-independent form, the new formulation can be applicable to estimating energy conversions for stationary eddies or snapshot of transient eddies. Actual applications of the new form of the energy conversions to the data analysis will also be given.

キーワード：準地衡擾乱、エネルギー変換、長周期変動
Keywords: quasi-geostrophic eddy, energy conversion, low-frequent variability in the extra-tropics

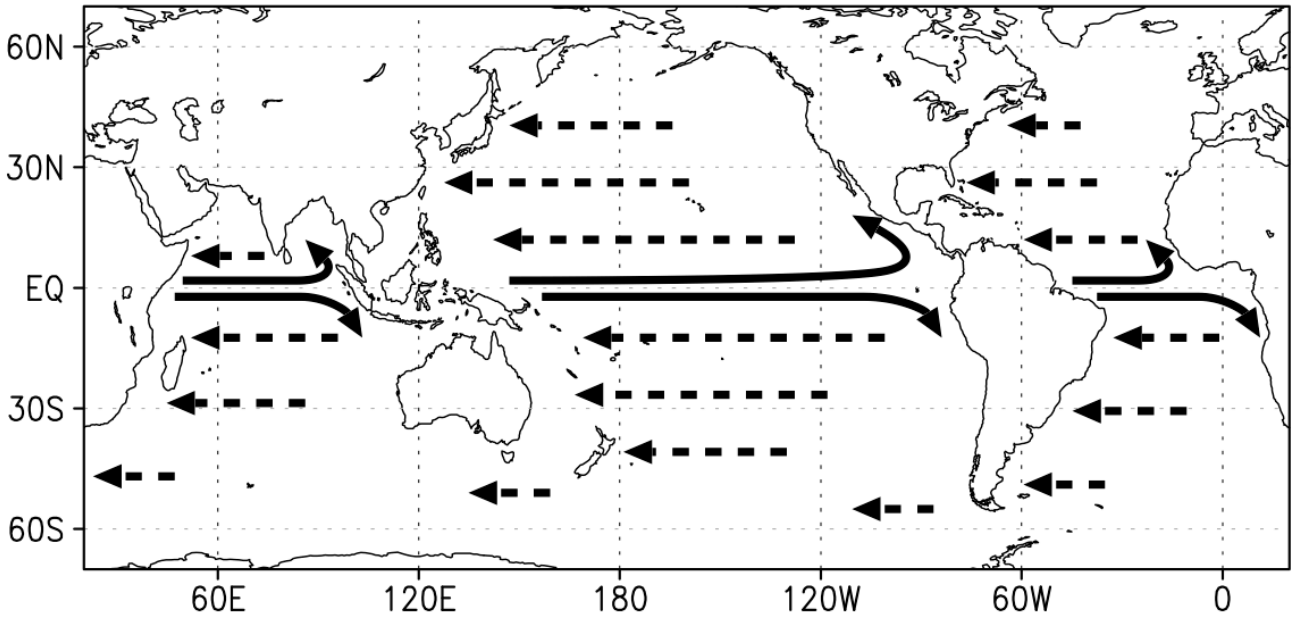
赤道域と中緯度域の相互作用解析に適したエネルギーフラックス診断式
Towards a seamlessly diagnosable expression for the energy flux associated with both equatorial and mid-latitude waves

*相木 秀則[1,2]、Greatbatch Richard[3,4]、Claus Martin[3]
*Hidenori AIKI[1,2], Richard J Greatbatch[3,4], Martin Claus[3]

1. 名古屋大学 宇宙地球環境研究所、2. 海洋研究開発機構 アプリケーションラボ、3. GEOMAR Helmholtz-Zentrum fur Ozeanforschung Kiel、4. University of Kiel
1. Institute for Space-Earth Environmental Research, Nagoya University, 2. Application Laboratory, Japan Agency for Marine-Earth Science and Technology, 3. GEOMAR Helmholtz-Zentrum fur Ozeanforschung Kiel, 4. University of Kiel

For mid-latitude Rossby waves (RWs) in the atmosphere, the expression for the energy flux for use in a model diagnosis, and without relying on a Fourier analysis or a ray theory, has previously been derived using quasi-geostrophic equations and is singular at the equator. By investigating the analytical solution of both equatorial and mid-latitude waves, the authors derive an exact universal expression for the energy flux which is able to indicate the direction of the group velocity at all latitudes for linear shallow water waves. This is achieved by introducing a streamfunction as given by the inversion equation of Ertel’s potential vorticity, a new and novel aspect when considering the energy flux. For ease of diagnosis from a model, an approximate version of the universal expression is explored and illustrated for a forced/dissipative equatorial basin mode simulated by a single-layer oceanic model that includes both mid-latitude RWs and equatorial waves. Equatorial Kelvin Waves (KWs) propagate eastward along the equator, are partially redirected poleward at the eastern boundary of the basin as coastal KWs, followed by the shedding of mid-latitude RWs that propagate westward into the basin interior. The connection of the equatorial and coastal waveguides has been successfully illustrated by the approximate expression of the group-velocity-based energy flux of the present study, which will allow for tropical-extratropical interactions in oceanic and atmospheric model outputs to be diagnosed in terms of an energy cycle in a future study.

キーワード：group velocity、model diagnosis、tropical-extratropical interactions
Keywords: group velocity, model diagnosis, tropical-extratropical interactions



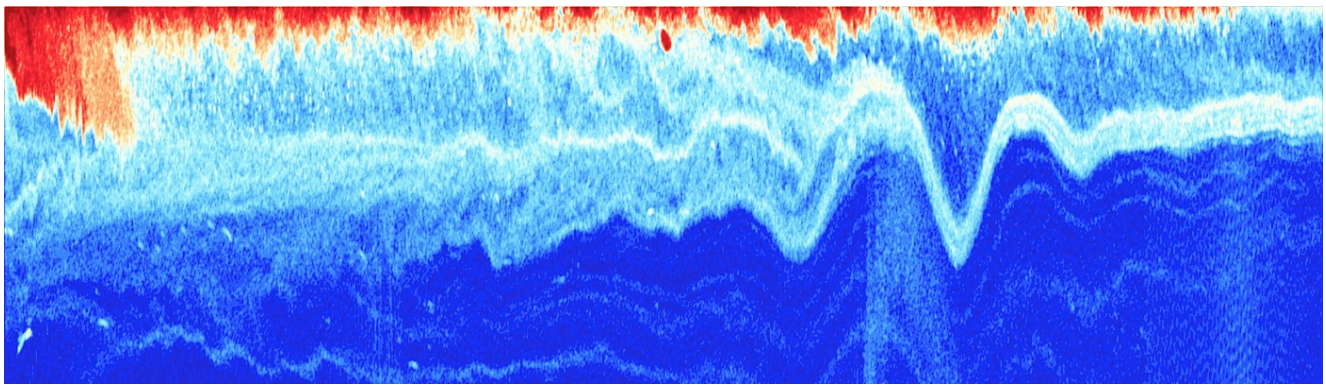
Generation of internal solitary waves by frontally forced intrusions in geophysical flows

*Daniel Bourgault[1], Peter Galbraith[2], Chavanne Cédric[1]

1. Université du Québec àRimouski UQAR, 2. Fisheries and Oceans Canada, Maurice Lamontagne Institute

Internal solitary waves are hump-shaped, large-amplitude waves that are physically analogous to surface waves except that they propagate within the fluid, along density steps that typically characterize the layered vertical structure of lakes, oceans and the atmosphere. As do surface waves, internal solitary waves may overturn and break, and the process is thought to provide a globally significant source of turbulent mixing and energy dissipation. Although commonly observed in geophysical fluids, the origins of internal solitary waves remain unclear. Here we report a rarely observed natural case of the birth of internal solitary waves from a frontally forced interfacial gravity current intruding into a two-layer and vertically sheared background environment. The results of the analysis carried out suggest that fronts may represent additional and unexpected sources of internal solitary waves in regions of lakes, oceans and atmospheres that are dynamically similar to the situation examined here in the Saguenay Fjord, Canada.

Keywords: internal solitary waves, front, intrusion



日本海深層の底層水における近慣性周期のGyroscopic Wave
Near-inertial Gyroscopic Wave in the Bottom-layer Water of the Japan sea

*伊藤 海彦[1]、磯田 豊[1]、千手 智晴
*Umihiko Ito[1], Yutaka Isoda[1], Tomoharu Senjyu

1. 北海道大学大学院水産科学研究院
1. Hokkaido University Graduate School of Fisheries Sciences

１．はじめに

水深200m前後で水温1℃以下となる日本海深層の密度成層は非常に弱く，2500m以深では鉛直的に密度一様（浮力振動数Nはほぼ零）な底層水（Bottom-layer Water：以下，BWと略す）が形成されている。このBW内を含め，日本海深層域で最も卓越した流速変動の周期は近慣性周期にある（Mori et al., 2005）。内部慣性重力波の慣習的な線形理論（コリオリの鉛直成分のみを考慮）に従えば，その存在周波数帯はN～f（慣性周波数）に制限される。それゆえ，BW（N～0）直上でN=fとなる日本海深層の場合，上方から下方へ伝播（群速度）する近慣性周期の内部波がBW内まで侵入することは不可能である。しかし，現実には近慣性周期の何らかの変動がBW内へ侵入しており，本研究ではコリオリの鉛直成分（以下，fsと略す）に加えて，水平成分（以下，fcと略す）も考慮すれば，それが可能であることを示す。なお，fc項を考慮した非成層（N=0）流体に存在し得る，非静水力学の線形波動は，LeBlond and Mysack（1978）が提唱したGyroscopic Wave（以下，GsWと略す）と呼ばれる。

２．伝播方位に依存した近慣性波のBW内侵入の可否

コリオリの両成分を考慮したGsWでは，方位が重要なパラメータとなる。それゆえ，f平面近似であっても，GsWの伝播方位（東西南北）により，その分散関係には非対称性が生じる。以下の計算では，日本海の緯度を40°Nで，深層で卓越した近慣性波の周波数はσ=1.01fsで代表させる。詳細は省略するが，BW内まで侵入可能な周波数帯は，GsWの伝播方位（θ=0°～90°で東西伝播から南北伝播を表現）を考慮した解の存在範囲から求められる。Fig.1は伝播方位θの関数で表示した，GsWが存在可能な最大周波数σ_{max}（fs値で規格化）分布である。東西伝播（θ=0°）する近慣性波（σ=1.04fs）のBW内侵入は不可能であるが，$20^\circ < \theta < 90^\circ$ の比較的広い方位の近慣性波が侵入可能である。ただし，南北伝播に近いほどBW内侵入の周波帯が拡がり，完全な南北伝播（θ=90°）の侵入可能な周波数帯は0～fs～2Ω（Ωは地球自転の角速度）となる。

３．WKB近似による近慣性波の解析解

fc項を考慮した内部波及びGsWの分散関係は，同じ伝播方位であっても，上方からの入射波と海底からの反射波では大きく異なる鉛直伝播方向を示す。講演では日本海のCTD観測で得られた密度データを用いて，WKB近似による近慣性波（σ=1.04fs）の解析解を示すが，本要旨では入射波と反射波の非対称性が特に顕著なBW内（厚さ1000m）の解析解（鉛直流成分）をFig.2に示した。(a)が南北伝播（θ=90°）のケース，(b)が東西伝播に近いθ=20°のケースである。両ケースで入射及び反射の角度は異なるものの，どちらも入射角度に比して反射角度が非常に小さい。すなわち，反射波は海底面を這うような方向に伝播し，これは鉛直高波数の波（GsW）への変化を意味する。

上記の分散関係の議論から，日本海北方から下方へ入射する近慣性波がGsWの性質をもてば，BW内（N～0）への到達が可能となり，鉛直高波数となる反射波は海底付近に捕捉され，さらに，BWの鉛直混合（BWの密度一様性）にも寄与している可能性が示唆される。

キーワード：コリオリの水平成分、近慣性周期、Gyroscopic Wave、日本海深層
Keywords: horizontal component of Coriolis parameter, Near-inertial frequency, Gyroscopic Wave, Bottom-layer Water

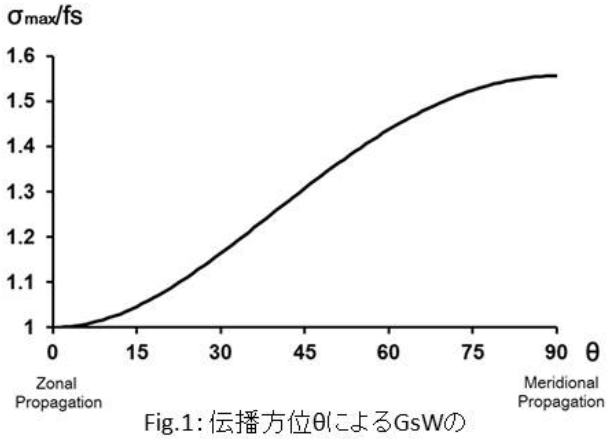


Fig.1: 伝播方位θによるGsWの存在最大周波数分布

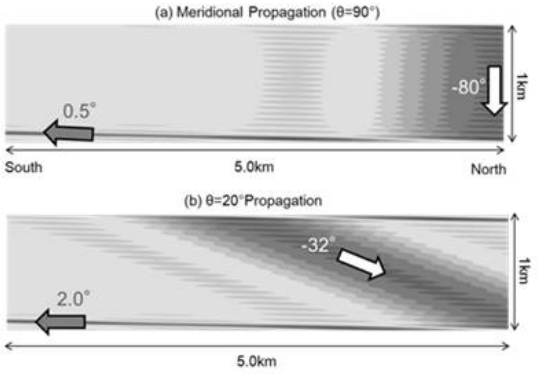


Fig.2: 伝播方位(a)θ=90°，(b)θ=20°のケースにおけるBW内の近慣性波

Impact of Ocean Surface Waves on Air-Sea Momentum Flux

*田村 仁[1]、Drennan William[2]
*Tamura Hitoshi[1], William Drennan[2]

1. 港湾空港技術研究所、2. Univ. of Miami
1. Port and Airport Research Institute, 2. Univ. of Miami

In this study, we investigated the structure of turbulent air flow over ocean waves. Observations of wind and waves were retrieved by air-sea interaction spar (ASIS) buoys during the shoaling waves experiment (SHOWEX) in Duck, NC in 1999. It is shown that the turbulent velocity spectra and co-spectra for pure wind sea conditions follow the universal forms estimated by Miyake et al [1970]. In the presence of strong swells, the wave boundary layer was extended and the universal spectral scaling of u'w' broke down [Drennan et al, 1999]. On the other hand, the use of the peak wave frequency (fp) to reproduce the "universal spectra" succeeded at explaining the spectral structure of turbulent flow field. The u'w' co-spectra become negative near the fp, which suggests the upward momentum transport (i.e., negative wind stress) induced by ocean waves. Finally, we show the relationship between the turbulent flow structures and roughness of the sea surface.

太平洋を横断する海洋外部重力波の発生場所とその季節変化
The excitation location of external gravity waves traveling across the Pacific Ocean and its seasonal variation

*利根川 貴志[1]、深尾 良夫[1]、塩原 肇[2]、杉岡 裕子[3]、伊藤 亜妃[1]、山下 幹也[1]
*Takashi Tonegawa[1], Yoshio Fukao[1], Hajime Shiobara[2], Hiroko Sugioka[3], Aki Ito[1], Mikiya Yamashita[1]

1. 海洋研究開発機構、2. 東京大学　地震研究所、3. 神戸大学　理学研究科　惑星学専攻
1. Japan Agency for Marine-Earth Science and Technology, 2. Earthquake Research Institute, The University of Tokyo, 3. Department of Planetology, Graduate School of Science, Kobe University

At deep seafloor, large amplitude of external gravity wave, i.e., infragravity wave (IGW), is persistently observed at frequencies of 0.003–0.03 Hz (30–300 s) in noise spectrum of pressure records. Previous works reported that the generation of the IGW is possibly related to ocean swell and its location is near shoreline. In this study, we investigate the characteristics of the IGW propagating in the ocean, by examining a spectral analysis and an interferometric method. Comparing these observations with the spatio-temporal distribution of ocean swell, we try to find possible locations where the IGW observed off Aogashima is generated.
Off Aogashima in the Izu-Ogasawara region, south of Japan, 10 pressure gauges with a station spacing of 10 km were deployed during May 2014 and May 2015. The locations are 50–100 km east of Aogashima, and the water depth ranges from 1400 to 2300 m. The sampling rate is 4 Hz.
In the obtained results, we found the following three remarkable observations relevant to the IGW observed off Aogashima. Firstly, we calculated running spectrum, i.e., spectrogram, of ambient noise records for a time-period of four months (June–Sep. on 2014). As a result, we found temporal and frequency variations of the IGW amplitude. For example, there are several events that show large amplitude at lower frequencies (0.003–0.01 Hz), and also at higher frequencies, e.g., 0.03 Hz, but with a time-delay of 3 days relative to that at lower frequencies (one example is shown by an arrow in Fig. 1a). The amount of the delay is continuous as a function of frequency. Secondly, we investigated the propagation direction of the IGW. We extracted the IGW propagating between all pairs of two pressure gauges deployed off Aogashima by using an interferometric method, and performed an array analysis. As a result, the IGW is persistently coming from east in summer. If we calculate the ray path of the IGW eastward from the station, it reaches to the shoreline in South America. Moreover, the propagation times between South America and one station off Aogashima were approximately 360,000 s and 95,000 s at frequencies of 0.03 Hz and 0.007 Hz, respectively, resulting in 265,000 s (3.07 days) in differential time; the differential propagation speed as a function of frequency is caused by dispersion of the IGW. This is in good agreement with the observation of the time delay of 3 days. Thirdly, as mentioned above, several events with relatively large IGW amplitude can be seen in the running noise spectrum. It seems that the occurrences of these events correlate with the timings at which strong swell in the southern hemisphere approaches eastward to the shoreline in South America, rather than swell observed around Aogashima (Fig. 1b). Based on these observations, we interpret that the IGW observed off Aogashima in summer is excited near the shoreline in South America. On the other hand, in winter in the northern hemisphere, it seems that the excitation location of the IGW is changed to the shoreline in North America.

キーワード：海洋外部重力波、海底圧力計アレー

Keywords: external gravity wave, deep seafloor observation

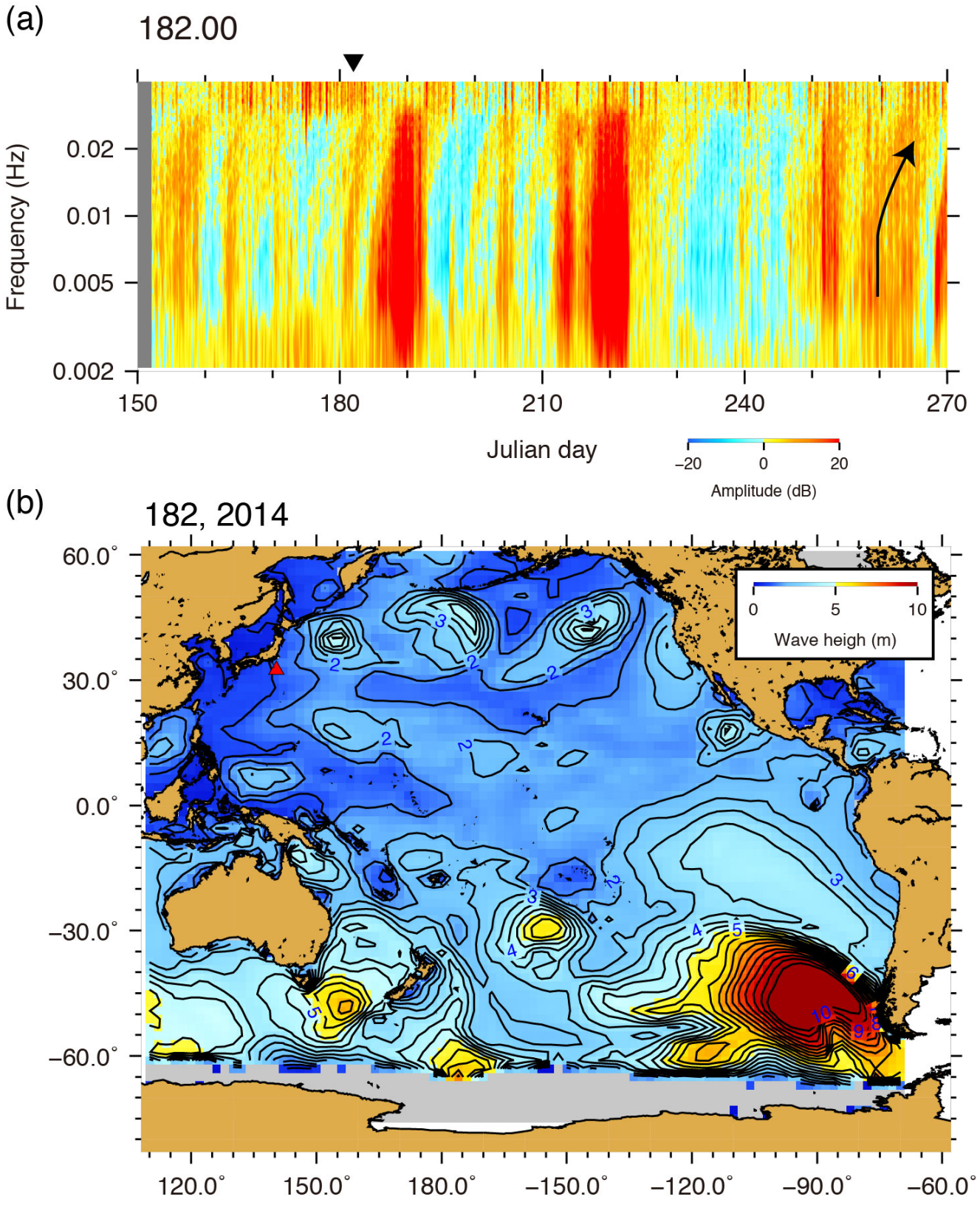


Figure 1. (a) Perturbations of the IGW amplitude as functions of time (day) and frequency, i.e., running spectrum. (b) Wave height distribution on 182 (julian day), 2014, from WAVE WATCH III (Tolman, 2005). A strong swell can be seen near South America, and a large IGW amplitude can also be seen on 182, indicated by inverted triangle in Fig. 1(a).

Topography-dependent relation between offshore wind field and swell-dominant surface waves observed inside bays on the Sanriku ria coast of Japan

*小松 幸生[1,2]、田中 潔[2]
*Kosei Komatsu[1,2], Kiyoshi Tanaka[2]

1. 東京大学大学院新領域創成科学研究科、2. 東京大学大気海洋研究所
1. Graduate School of Frontier Sciences, The University of Tokyo, 2. Atmosphere and Ocean Research Institute, The University of Tokyo

Real-time monitoring of wind and surface waves in Otsuchi Bay, a ria in the Pacific coast of Sanriku, the northeastern portion of Japan, has been continued since October 2012, using a mooring buoy with an ultrasonic anemometer and a single-mode GPS wave sensor. We analyzed two-dimensional energy spectra of surface waves and wind data monitored hourly over four years in order to assess the variability and occurrence of wind and waves and to elucidate the main reasons for wave variation in Otsuchi Bay. The monitoring data revealed in all seasons that surface waves in the bay were predominantly affected by swells propagated from the northeastern offshore region and that the wave height was significantly correlated with the component of wind velocity toward the bay in the northeastern offshore region that faces the bay mouth. The offshore wind field was expected to provide information useful for predicting coastal waves in rias bays in Sanriku such as Otsuchi Bay. More interestingly, comparison of the horizontal distribution of strong correlation between the offshore wind field and the significant wave height in rias bays, Miyako and Kamaishi Bays close to Otsuchi Bay clarified that the offshore wind field which affects predominantly surface waves in rias bays depends heavily on the topographic shape of the bay.

キーワード：海面波、リアス湾、うねり、沖合海上風
Keywords: surface wave, ria bay, swell, offshore wind

