－ 木星観測 －
プロ & 海外アマとのコラボレーション

EPSC : European Planetary Science Congress, Euro Planet Society
DPS : Division for Planetary Science, American Astronomical Society
会 場 : Centre International de Conférences de Genève

Euro Planet Society年次総会と同時開催
惑星科学と惑星ミッションに関連する科学分野を網羅:58セッション
口頭発表:1062件、ポスター発表:876件、ワークショップ、パネルディスカッション

<会　場>

ジュネーブ国際会議センター

会場中央ホール
参加者：52カ国、1730名
日本：52名

＜セッション解説（抜粋）＞

【プロ-アマ・コラボ】

Professional-Amateur collaborations in small bodies, terrestrial and giant planets, exoplanets, and ground-based support of space missions

プロ-アマチュア・コラボレーション ～ 小天体、地球型惑星・巨大惑星、太陽系外惑星、スペースミッションの地上ベースサポート における (口頭発表:12、ポスター:8)

1. アマチュアのレベルアップ

アマチュア天文学はここ数年で劇的に進化しました。今日やる気のあるアマチュアは、彼/彼女の裏庭の機器と利用可能なソフトウェアで、異なる波長で高解像度の惑星画像を取得することができます（多くのプロの天文台が15年前に達成できたレベルよりも優れています）。

2. プロ-アマ・コラボレーションの促進

何百人ものアマチュアは定期的にプロと仕事を共有し、非常に貴重なデータをプロに提供しています。これは、プロが観測リソースにアクセスする競争の激化に直面している時に非常に貴重です。さらに、アマチュアのネットワークは、観測を必要とする太陽系オブジェクトで発生する新しいイベントに非常に短時間で反応して、プロの望遠鏡と共にグローバルな観測キャンペーンに貢献できます。

＜セッション解説（抜粋）＞　【プロ-アマ・コラボ】

プロ-アマチュア・コラボレーション ～ 小天体、地球型惑星・巨大惑星、太陽系外惑星、スペースミッションの地上ベースサポート における (口頭発表:12、ポスター:8)

3. プロ-アマ・コラボレーションによる成果の公開

一部の経験豊富なアマチュアは、プロの要件を満たすデータを分析するための高度な方法を使用し、それによりプロとの定期的かつ緊密な共同作業を促進しています。多くの場合、これは査読付き科学雑誌に結果を公開することにつながります。例えば、木星・土星・海王星または金星の惑星気象、流星体またはホウ化物が木星に衝突する現象などの研究が含まれます。

4. 惑星探査機におけるプロ-アマ・コラボレーション

2016年7月以降、NASAの木星探査機:Junoは、接近したフライバイを伴う一連の長い楕円軌道から木星の内部構造を探索します。 NASAは木星の大気力学を理解するために巨大惑星を観測するアマチュアと協力しています。Junoとアマチュアの共同作業は、Junoに搭載されているビジュアルカメラ:JunoCamにリンクされています。アマチュアがエキサイティングな機会を示し、それがJunoCamからの高解像度観測の計画に使用され、木星の大気力学に関する知識を高めるユニークなデータセットを提供します。

【プロ-アマ・コラボ】

JUPITER'S GREAT RED SPOT (GRS) IS NOT DISINTEGRATING BY FLAKING APART

アマ:4名

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2019 AGU Fall Meeting
San Francisco CA
Poster P13B-3502

PHOTO: Mike Wong (Wawaloli HI)

アマがフレーク発見
追跡観測・解析

1. TIMELINE OF GRS FLAKES (FROM AMATEUR COLLABORATORS)

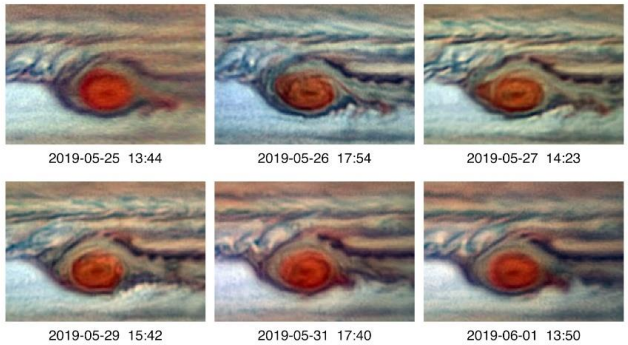


Fig. 1 - flake images: A cylindrical map sequence shows an assortment of morphologies of red material outside the typical vortex boundary. Large coherent formations on May 27, 31, and June 1 could be called "flakes" or "blades," while linear formations on May 25 and 26 could be called "streamers." No standard terminology exists. Near the GRS, the features share its counterclockwise rotation, but farther from the vortex, the features drift with the prevailing east-west winds. The "chimney" at the northernmost part of the GRS is shut off when flakes are most actively produced (see Fig. 2a "bay rift", and stagnation points in Marcus et al. 2019, P13B-3505).

Throughout 2019, observers were captivated as the GRS released red material into its surroundings. The best constraints on this activity come from amateur observers (Rogers 2019b), thanks to their high cadence observations.

The red material has been referred to as "streamers" when extended and linear in shape, and "blades" or "flakes" when concentrated in large but morphologically compact regions. Both types of features have been seen from the ground, Voyager, and Cassini (Momary et al. 2019, P21G-3445, Rogers 2019a, 2019b), but the level of shedding activity was very high in 2019. This led to speculation that the GRS could be disintegrating by flaking apart.

In many cases, flakes were produced after small anticyclonic ovals ("rings" in Fig. 2a) made close encounters with the GRS (Sánchez-Lavega et al. 2019, P44A-01 Thursday). In the drift chart, this shows up as red dots (flake measurements) produced when a series of grey dots (incoming small vortex measurements) extends toward the lower right until it intersects with the GRS. A small oval can also be seen passing around the northern edge of the GRS if Fig. 3.

As measured from the width of the red colored material, the GRS showed a rapid and dramatic 15% decrease in size during the height of the flaking activity (Fig. 2b). Once the activity died down in late July, the GRS size recovered to only ~90% its size at the beginning of the year.

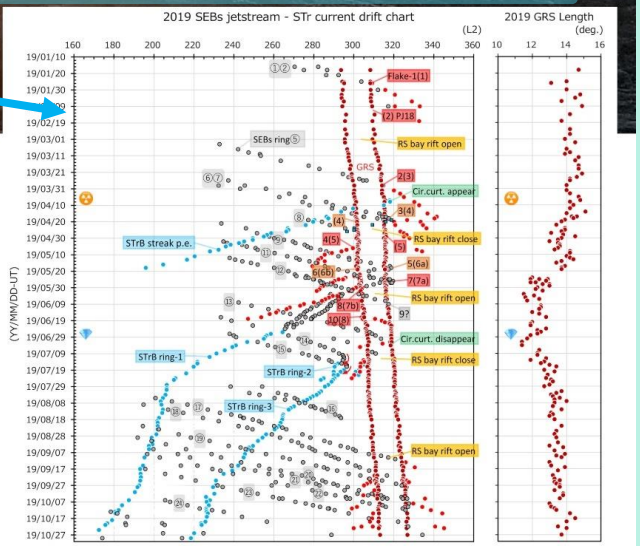
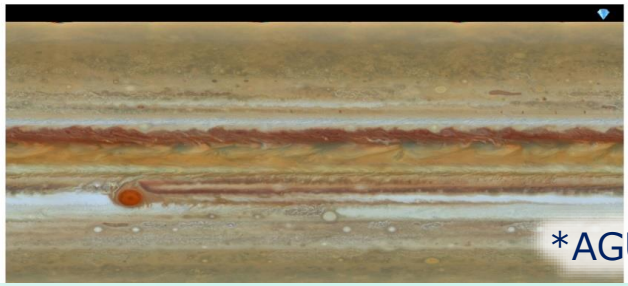


Fig. 2a - Feature drift chart: Positions measured from hundreds of individual amateur astronomer images are shown here, with time progressing downwards on the y-axis. The x-axis is System II west longitude, so features moving from upper left towards lower right are drifting westward toward the GRS (represented as parallel red lines).
Fig. 2b - GRS length chart: The longitudinal extent of the GRS, *as measured from the width of the colored material*, shows a significant decrease during the time period where the most flaking events took place.

プロが注目、解析

2. HIGH-RESOLUTION HUBBLE IMAGING DATA



3. GRS VELOCITY FIELDS

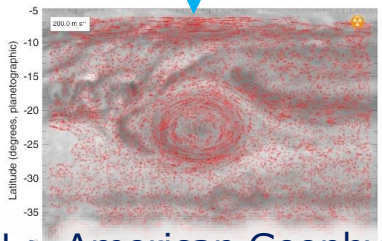
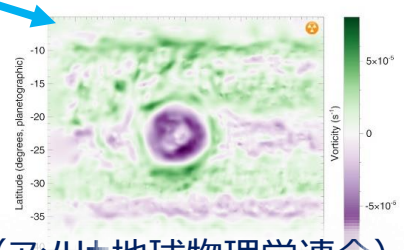


Fig. 5 - Velocity vectors (left): Only 10,000 vectors are plotted here, out of a total of 2.8×10^5 extracted from the image series. ACCIV produces velocity fields with high density of vectors, enabling accurate differentiation to measure things like divergence and vorticity.

Fig. 6 - Vorticity (right): As in previous epochs (Shetty et al. 2007), the GRS is a patch of negative relative vorticity, with a "hollow" center, shielded by a ring of positive vorticity.



*AGU： American Geophysical Union（アメリカ地球物理学連合）

＜プログラム（一部）＞

【海外アマとのコラボ】

Jupiter

13:40–13:55 | EPSC-DPS2019-546 |
The Great Red Spot in 2019 and its unusual interaction with retrograding vortices
Clyde Foster, John Rogers, Shinji Mizumoto, Andy Casely, and Marco Vedovato

アマ5名でコラボ

13:55–14:10 | EPSC-DPS2019-497
Amateur mapping of Jupiter's southern high latitudes to support JunoCam between Perijoves 12-15
Andy Casely and John Rogers

14:10–14:25 | EPSC-DPS2019-423
Experimental color analysis of Jupiter's clouds
Christophe Pellier

14:25–14:35 | EPSC-DPS2019-970
Jupiter impact detection project
Marc Delcroix, Ricardo Hueso, and Jon Juaristi

14:35–14:50 | EPSC-DPS2019-101
The Role of Amateur Observations in Characterizing the Current Equatorial Zone Disturbance in Jupiter
Glenn Orton, John Rogers, Arrate Antunano, Leigh Fletcher, and Thomas Momary

Technics

14:50–15:00 | EPSC-DPS2019-301
"Choosing the most effective imaging technique for planetary imaging in less than ideal conditions"
Constantin Sprianu

<プレゼンテーション資料>

【海外アマとのコラボ】

プレゼンテーション 表紙

EPSC Abstract

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EPSC-DPS Joint Meeting 2019

EPSC
EPSC-DPS Joint Meeting 2019
15–20 September 2019 | Geneva, Switzerland

The Great Red Spot in 2019 and its unusual interaction with retrograding vortices

Clyde Foster (1), John Rogers (2), Shinji Mizumoto (3), Andy Casely (4), and Marco Vedovato (5)

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Abstract

Early in the 2019 jovian apparition, ring-like structures on the southern edge of the South Equatorial Belt (SEBs) were recorded by various amateur planetary imagers. Due to the retrograding jet at this latitude, the rings were progressively drawn towards, and into, the Great Red Spot Hollow (GRSH). This resulted in deformation and ultimate dispersal of the rings, with interaction taking place with the Great Red Spot (GRS) as well as the South Equatorial Belt (SEB) immediately following the GRS. These interactions were apparently repsonsible for the repeated detachment of red 'blades' from the

Maps/j_Cylindrical_Maps.htm). After solar conjunction in 2018, good-quality ground-based imaging began in 2019 Jan. Meanwhile, the Juno spacecraft camera obtained views of the GRS at perijoves 17 (Dec.21), 18 (Feb.12) and 19 (April 6), especially at PJ18 when Juno flew very close to the GRS.

2. SEBs retrograding rings and their interaction with the GRS in 2019

Early in the 2019 apparition, amateur ground-based

GRSフレークが Juno PJ18画像で注目されるようになる2週間前にアマチュアがGRSの異常をキャッチ

<口頭発表>

【海外アマとのコラボ】

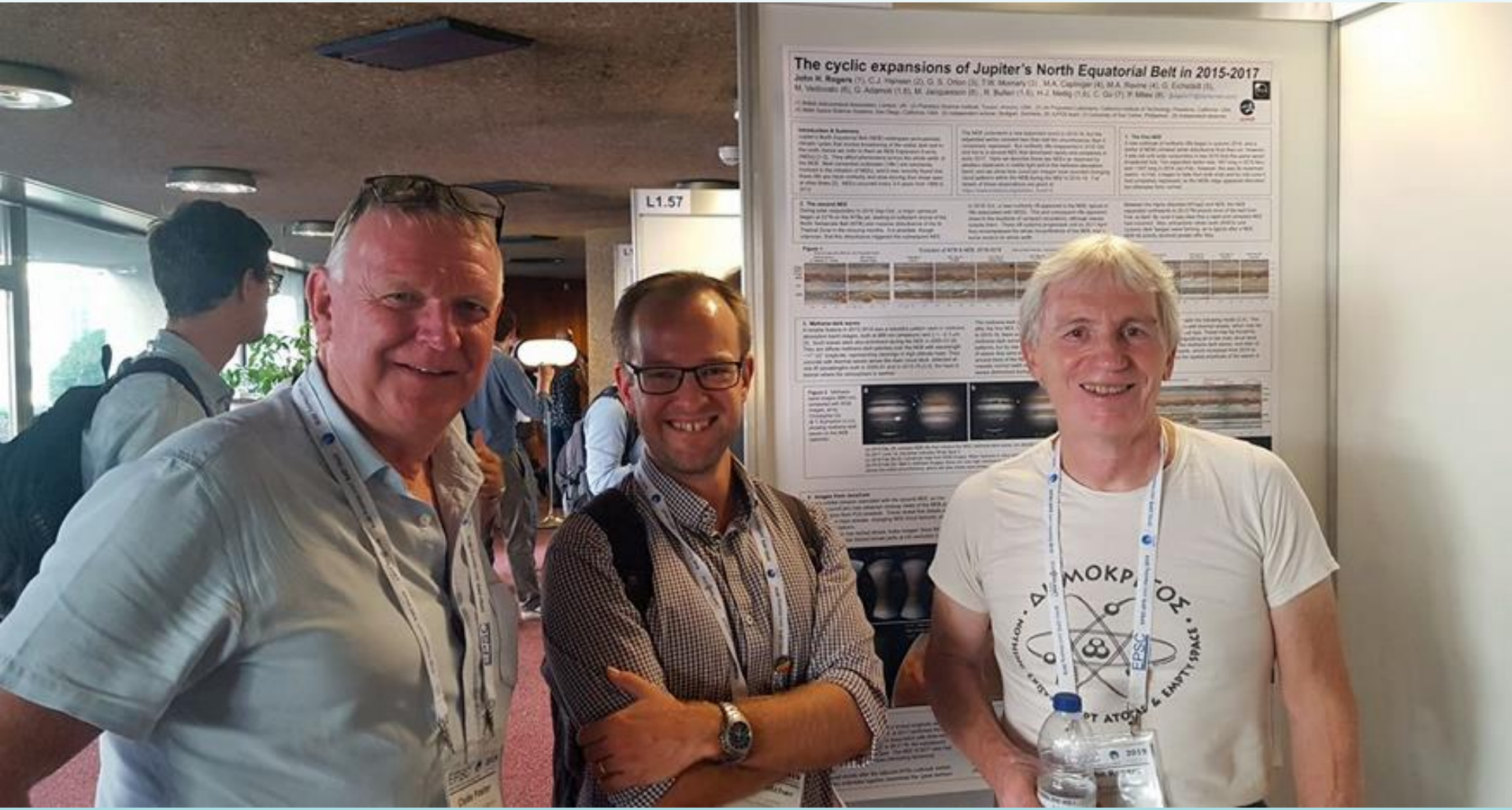
Clyde Foster (South Africa)
"The Great Red Spot in 2019 and its unusual interaction with retrograding vortices"

<口頭発表>

Andy Casely (AUS)

“Amateur mapping of Jupiter's southern high latitudes to support JunoCam between Perijoves 12-15”

<ポスター発表>



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Andy Casely
Gerald Eichstädt (GER)
Julia Eichstädt

Andy Casely　Glenn Orton　Clyde Foster

RAS Juno 2018 (London), EPS
と殆ど同じ顔ぶれ
RAS：Royal Astronomical Society

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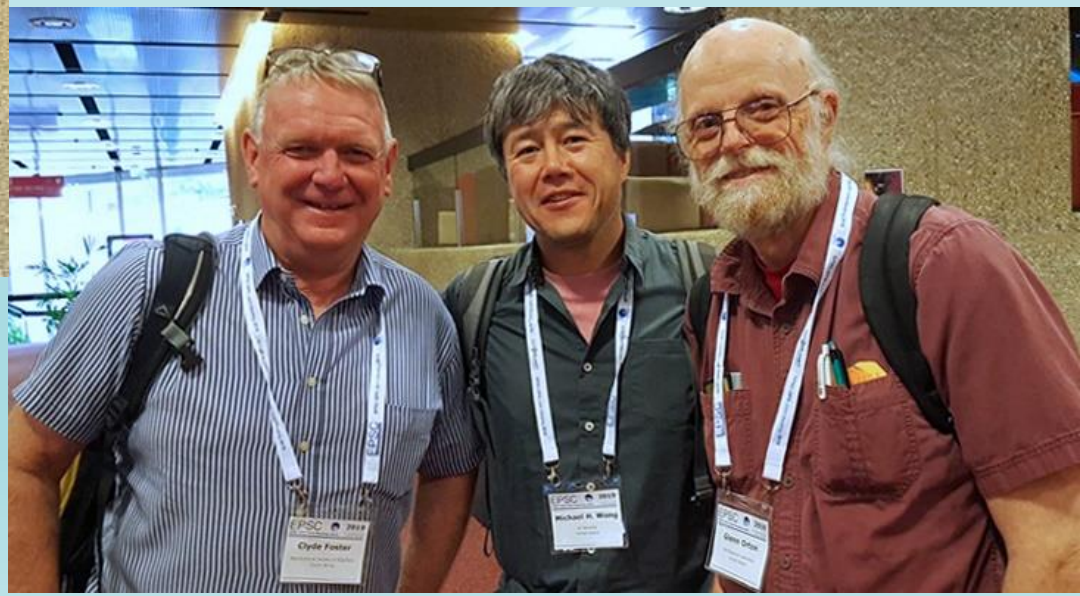
Imke de Pater
(UC Berkeley, USA)

Clyde Foster



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Andy Casely
Michael Wong
John Rogers
Clyde Foster

左から
Gerald Eichstädt
Constantin Sprianu (ROU)
Ricardo Hueso
Marc Delcroix

皆さんも国内外、プロ・アマを問わず コラボしてみませんか？

刺激的で充実した日々が待っています。

具体的にはどうすれば？：情報収集 & 情報発信 → 自分の意見

- 観測報告（月惑,OAA,PVOL,BAAなど）→ 世界で活用
- 月惑メーリングリストで発信（情報、質問、意見交換など）
- メールで発信（特定の個人と情報・意見交換）
- SNSで発信 & 収集（FB:BAA JS,PACA Jupiter）
- 例会、木星会議、学会（国内外）などで発表

□ 情報発信すれば反響・反応があるはず

以 上

by Shinji Mizumoto @ALPO-Japan (2019.12.22 月惑星研究会 例会)