Invisible forces of transformation: solar activity and gender balance in the dynamics of Brazilian society – insights from the Oral Presentation Round Table Chair

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Abstract. At the What if...? World History conference in Vigo, Spain, on March 26, 2025, two most relevant presentations at roundtable number two shared analysis that seem totally different but might be linked. While the first one considered the hypothesis that solar storms contributed to the 2013 social disorder in Brazil, the second examined the influence on public administration of the preponderance of women in strategic positions in the Brazilian Executive Branch. As a result, both studies considered the idea that invisible forces could influence both humans as individuals and collective groups, concluding the existence of a cause-effect relationship between solar and social energies. This paper reflects, based on these presentations, how complex systems as astrophysics, neuroscience, sociology, and gender studies, are sensitive to energetic and relational differences.

Keywords: Solar Storms; Neuroscience; Gender Equity; Alternative History; Brazil; Social transformation.

1. Introduction

Regarding the dynamics of change in complex human systems, this article is based on two oral presentations[1] delivered during the 4th International Conference of 'What if?...' World History 24/25 (WhatIf 24/25) event, from two distinct Brazilian research teams.

The first one, presented by Alfredo Behrens, analyzed how in June 2013, a very large group of Brazilians hit the streets as an expressive form of protest. In fact, "In June 2013, Brazil witnessed one of its largest protest movements in history when more than 1 million Brazilians marched on city streets to demand improvements to urban life", as reported by other researchers [1]. This academic collective went on defending that besides socio-economic and political issues, as transport fare increases and the fight against corruption [2], an unconventional hypothesis was presented: could cosmic factors, such as solar storms, have played a role in the timing and emotional intensity of these collective mobilizations?

[1] The studies, as per the oral presentations mentioned in this work, can be accessed here: https://www.youtube.com/watch?v=MF8-3SNNPJU

In the other hand, the academic team La-Bora! [3], Brazil's laboratory for innovative management, led by Professor Débora Fischer Furloni, shared another different but equally transformative question, related to Brazilian administration, examining the impact of gender balance in decision-making, institutional culture, and innovation: what would change if women were the majority in strategic positions of the Executive Branch?

At a superficial initial glance, these studies seem to have no connection between each other, but both examine the power of invisible forces, whether electromagnetic or relational, to transform social reality. Nevertheless, this paper equally reflects on both studies, facing them as mutually complementary to better understand the energetic and constant dynamics of human behavior.

2. Methodology

Considering that the present paper relies upon two independent yet convergent research approaches, it adopts a comparative-interpretive methodology to combine both cases, summarized as follows:

- Considering that geomagnetic disturbances, stemming from solar activity, may trigger subtle yet measurable changes in human moods and behaviors as per published research [4 - 6], Behrens and team conducted a correlational analysis of the National Aeronautics and Space Administration (NASA)[2], which main focus is the study of space and scientific research, and National Oceanic and Atmospheric Administration (NOAA)[3] - rather focused on earth, weather, oceans, and space weather investigation - records of solar and geomagnetic activity and the timeline of Brazil's 2013 social uprisings [1]. The goal was to identify temporal correspondences between geomagnetic disorder peaks and these large protest events, using qualitative pattern recognition methods to achieve an acceptable verified correlation rather than proof.

- Furloni and coauthors investigated gender distribution in leadership in Brazil´s Ministry of Management and Innovation (MGI) [7]. This research was based on data extracted from interviews and institutional information, both on decision-making styles, policy innovation capacity, and organisational climate, to model hypothetical results considering women to be the majority in strategic positions.

To achieve this comparative framework approach, the paper is sensitive to how solar and emotional energy flows interact with humans, how collective groups respond to invisible stimuli and how systems tend to auto-reorganise after unrest.

3. The context of the presented works

The authors of the first oral presentation reflected on the possible correlations between cosmic and human systems without pursuing a cause-and-effect demonstration, proposing that the peaks of solar activity recorded in 2013 coincided with the period of Brazil's mass protests, potentially acting as a bioenergetic amplifier of existing social tensions. This claim was based on previous reports [8, 9] that solar storms interact with the Earth's geomagnetic field, subtly affecting human bioelectrical systems, such as the nervous, cardiovascular, or neuromuscular systems, namely stating that "[…] measurements were more sensitive to space weather variations in comparison with evening measurements" [9]. In addition to a verified a correlation between solar activity and human biological rhythms [10], there has

[2] Official NASA site: https://www.nasa.gov/
[3] Official NOAA site: https://www.noaa.gov/

been decade-long evidence that "weak brain-frequency fields may influence certain aspects of imaginings and alter suggestibility" [11].

Regarding the second presentation, the La-Bora! research team investigated gender balance in decision-making, exploring the possible influence of a female leadership majority in a government institution, and how it impacted the stimulation of cooperation, innovation, and inclusive policymaking. In fact, based upon historical fact verse counterfactual possibilities[4], their study analyzes how women`s lack of representation in political and executive leadership remains today a global challenge – as reported by OECD [12] -, with direct consequences on governance and innovation [13]. In fact, gender equity works as a balanced impulse, redistributing cognitive and emotional ´goodwill` within organizations, as women's participation is correlated with improved institutional trust, better policy awareness, and enhanced public value creation [14]. Also relevant to notice is that empirical research has been demonstrating that a multi-gendered leadership performs greater empathy [15], ethical awareness, and long-term plan [16].

Despite both research occupying distinct study fields, their combination emphasizes the power of invisible forces, cosmic or social, to provoke visible changes: solar storms as the external society´s invisible disturbing forces and gender balance as the unseen internal power of change in organizations.

4. Thought-provoking possibilities: what if

Bridging the two research, the first general outcome possible to extract reinforce the notion that human societies are open systems sensitive to perturbation and resonance [17], better understood once framed by complexity theory and systemic thinking [18]. Regarding the effects of solar activity on the Brazilian protests in 2013, while plural socio-political issues displayed a clear presence, such as discontentment with governance and economic differences, the coexistence with solar disturbances urges an interdisciplinary reflection. The protests provoked emotional contagion [1], spontaneous organization [19], and rapid diffusion, typical patterns of systems under energetic excitation [20]. A changed ethics that incorporated this knowledge could resulted on a different 2013 Brazilian scenario during the protests, was the proposal of Behrens et al.

The La-Bora! team simulations defended, by proposing an alternative history scenario for the Brazilian COVID-19 response, that a female-majority leadership can significantly alter the dynamics of public administration. Where women`s governance styles are accepted to be more empathic and participative decision-making [21], and also more based on a network kind of management [22], thus establishing a strong correlation with increased innovation and institutional trust.

Both cases reveal a complete sensitivity to energetic balance. Considering the first, solar radiation alters human systems externally, underlining the protests' volatility. Regarding the second, gender balance stabilizes them internally, showing the gender-balanced governance harmony. Together, these studies present different realities that permanently tend to auto-regulation, where small changes in invisible issues lead to large-scale visible transformations.

5. Possible implications

The combination of these two studies, resourcing to counterfactual or alternative history scenarios, is relevant to establishing a platform where change can be continuously rethought while being sensitive to

[4] For the purposes of the current work, counterfactual and alternative history are considered as defined as "how the course of history might have been altered, considering what possible and different outcomes might have resulted", as per the article available here https://www.up.pt/casacomum/wp-content/uploads/sites/520/2022/07/02.pdf

the sense of causality in social occurrences. While the 2013 Brazilian protests could demonstrate how human collective behavior can suddenly erupt from a confluence of emotional, informational, and possibly biophysical factors, the gender-balance scenario presents how a deliberate structural transformation can enhance resilience and harmony within institutions. The combination of both demands a wider recognition of visible and invisible forces on human systems.

From an astrophysical angle, the human organism is an electromagnetic system embedded within planetary and cosmic fields [23]. From a sociological point of view, human institutions are networks of energy, information, and meaning [24]. Both insights are subject to variation and adaptation. The parallel between solar storms and gender proportion is therefore both figurative and educational, as each one reveals how systems respond to shifts in energy distribution. Solar storms affect mood and emotion, while gender balance has an effect on institutional empathy. In both domains, emotional regulation becomes central to stability, as emotional intelligence determines collective performance [25]. Summed up, a two-way flux then occurs societies that are induced by external factors, whether these are solar or social, can react massively and spontaneously, whereas institutions infused internally with empathy can absorb shocks and innovation.

6. Future Perspectives and conclusions

This study explores two distinct but convergent research about how invisible forces can influence individuals and human organizations, specifically regarding the impacts of solar activity on humans´ collective behavior, and gender balance as a way to harmonize institutional governance.

Considering governance as the management of social energy, there is a convergence of this different research into the idea that transformation occurs when new energy flows happen, once protests represent an excess of collective energy, and gender equity its harmonious reorganization. Both point out the importance of resonance and coherence in maintaining a balanced society. While although acknowledging that causal proof remains in need as far as both domains are concerned, these presentations underscore the relevance of exploring unconventional perspectives in social studies, by recognizing the subtle cause-effect relationship between natural and social energies. So, they invite further investigation into the possibility that visible changes in human societies can be influenced by invisible forces.

In addition, our current reflection highlights the need in the future to enhance the number of academic reports about the various possible causes of both individuals and human collectives´ transformations, as, for example, the variability of female neuroendocrine or the changes on women related with their menstrual cycle dynamics. Alongside with this expanded literature, other equivalent topics will most certainly enrich the existent literature on female leadership and organizational resilience.

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