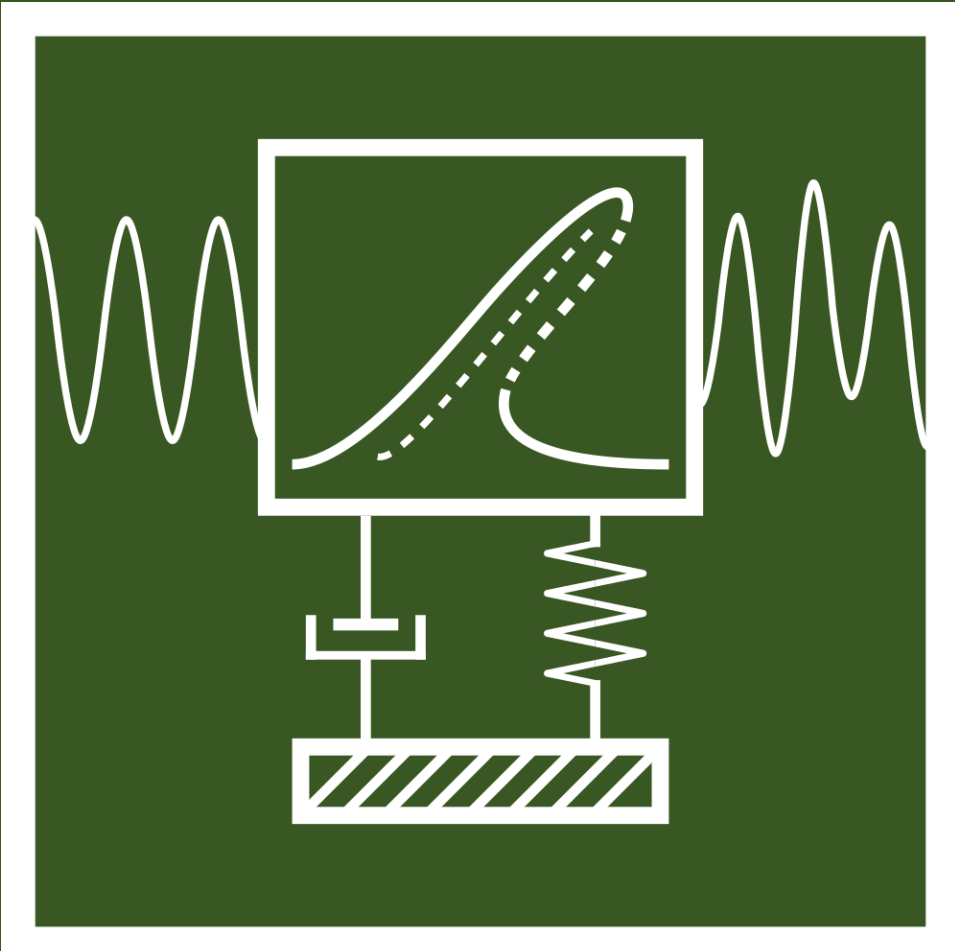


Complexity Matching between Schumann Resonances and Milk Yield in Dairy Cows: A Potential Indicator of Bioenergetic Interaction

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A

Abstract

Milk yield in dairy cows is influenced by a complex [2] interplay of genetic, nutritional, climatic, physiological, management, social, and behavioral factors, yet a substantial part of the variation in actual production remains unexplained. Nelson (2025) proposes further investigation of low-frequency electromagnetic environments as potential modulators of biological processes, including lactation. Therefore, investigating alternative factors - such as natural geophysical phenomena (e.g., Schumann resonances) and their possible correlations with biological processes - may help to further elucidate currently unaccounted determinants of dairy cow productivity.

01



Methods

Dataset: 895 days of daily milk yield and Schumann resonance (SR) magnetic field data from a Lithuanian dairy herd.

SR bands:

- δ (0–3.5 Hz),
- θ (3.5–7 Hz),
- α (7–15 Hz),
- β (15–32 Hz),
- γ (32–65 Hz).

Complexity matching: Hankel matrix + Perfect Matrix of Lagrange Differences (PMLD).

Statistics: Spearman rank correlation (ρ) between milk-yield and SR complexity measures, evaluated by frequency band.

02

Results

Figure 1 represents the time series plots for the raw data, which illustrates the variations in the milk production in cows versus the magnetic field frequency ranges respectively. The alpha band showed the strongest (Fig. 2) and statistically significant positive correlation with milk yield, with the highest complexity matching (61.1%). Meaningful associations were also observed in the Delta and Gamma bands, suggesting that specific SR bands may be associated with variation in milk yield.

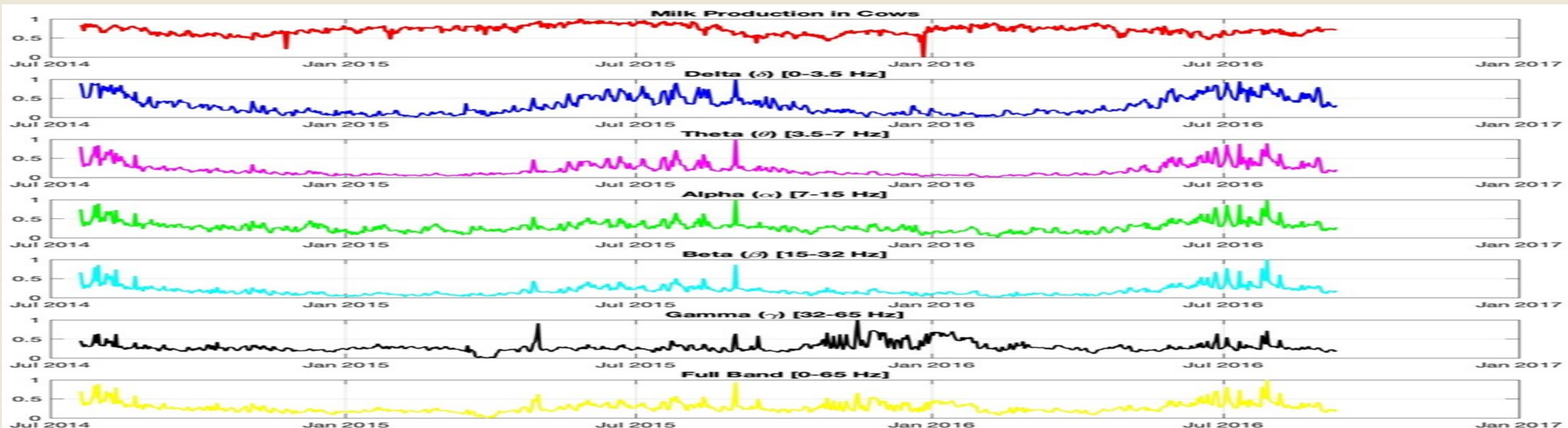


Fig 1. Time series representation of different frequency ranges alongside milk yield in cows

03

Discussion

- ✓ Interactions between organisms and their electromagnetic environment may represent an emerging interdisciplinary research direction.
- ✓ Integrating geophysical data into animal science could help explore currently unexplained variation in milk production.

04

Conclusions

- ✓ Complexity matching was detected across all analyzed SR frequency bands.
- ✓ The strongest association was observed in the alpha band (7–15 Hz).
- ✓ Although correlations were modest, the findings indicate a potential association between Schumann resonance dynamics and fluctuations in dairy cow milk yield.
- ✓ Schumann resonance may represent a potential environmental correlate of animal productivity, warranting further investigation.

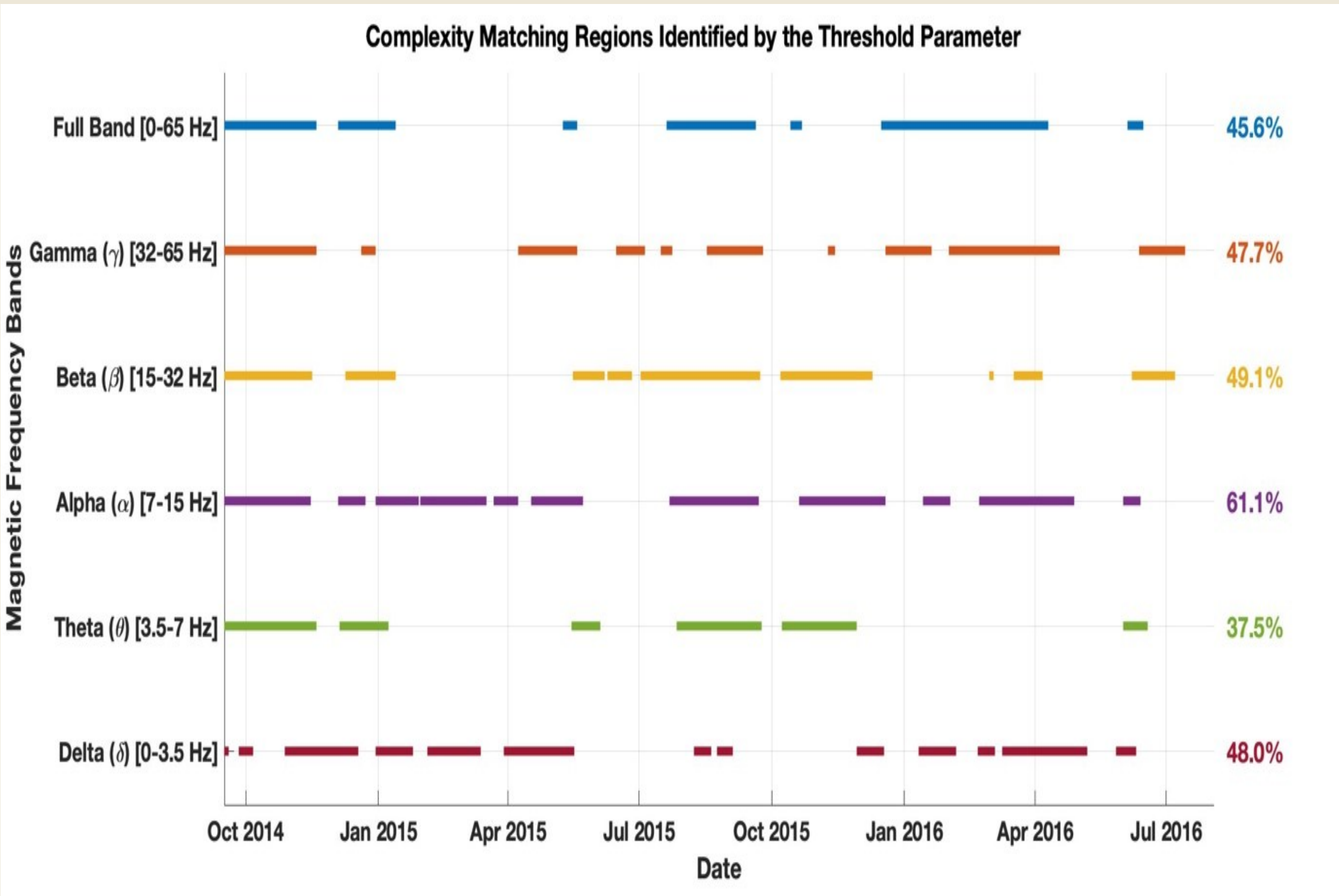


Fig 2. Strong synchronization regions between milk yield and Set 1 frequency bands (Delta, Theta, Alpha, Beta, Gamma, Full Band).

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Complexity matching between the Schumann resonances and milk yield in dairy cows – a case study from Lithuania

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Fig 3. Related publication – detailed methodology and results

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