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[4]Cary Institute of Ecosystem Studies
[5]Earth Science Division, NASA Goddard Space Flight Center

April 16, 2024

Historical Rainfall Anomalies as a Proxy for Geographic Patterns of Rift Valley Fever Activity (GH43A-1137)

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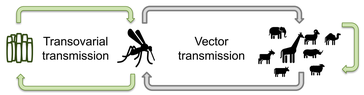
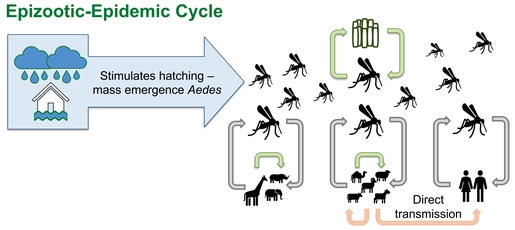
Rift Valley Fever (RVf)

An acute viral hemorrhagic fever primarily affecting domesticated animals caused by the Rift Valley Fever virus (RVFV), which is also capable of infecting humans.

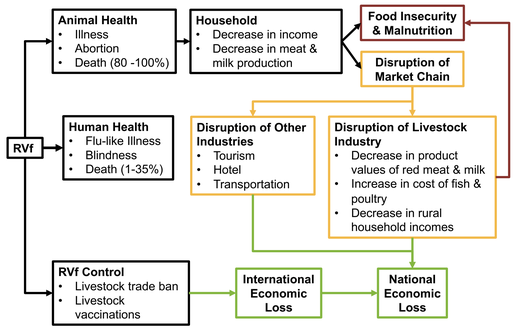
Enzootic Cycle



Epizootic-Epidemic Cycle



Impact of RVf



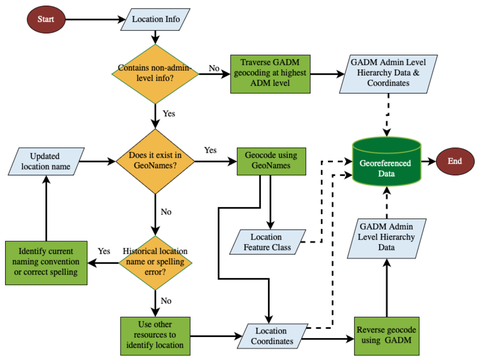
Bio-weaponization attempts were made in the 1960's. As a cross-over pathogen, it is a public health concern affecting national and international security.

An animal vaccine exists but is cost-prohibitive to small-scale farmers. A human vaccine also exists, but it is not licensed or commercially available.

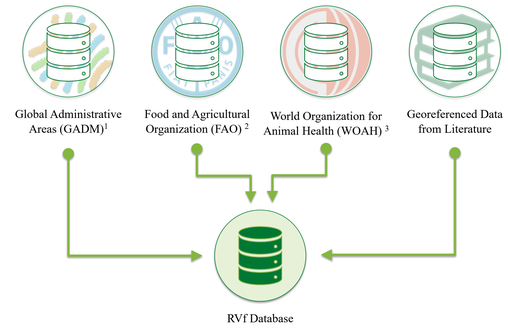
No licensed virus-killing drug is available for human use. Ribavirin and favipiravir have been used experimentally, but more work is needed to determine their efficacy.

Data & Methods

Georeferencing Data from Literature



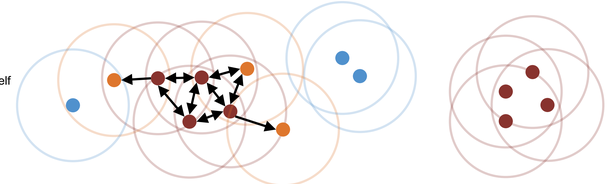
Curating RVf Database



Density-based spatial clustering of applications with noise (DBSCAN)[4] - $\theta \in \{minPts, \varepsilon\}$

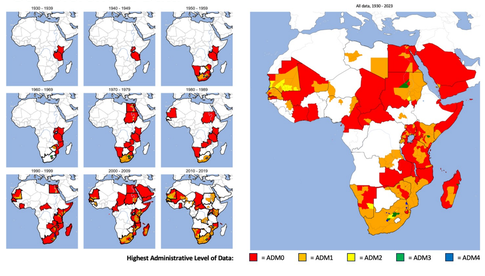
Let $minPts = 4,\ \varepsilon = 1''$

- = core – point that contains at least $minPts$ points within distance of ε
- = border – point within distance of ε from a core point, but not a core point itself
- = noise – point that is neither a core point or border point
- $\{\ \} \cup \{\ \}$ = Cluster, $C_i\ wrt.\ \theta$

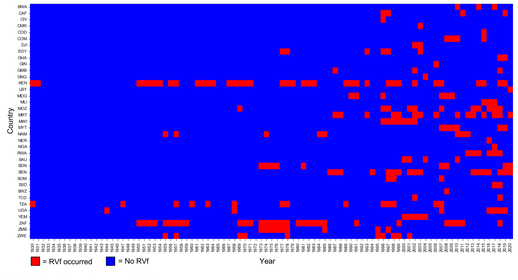


Results

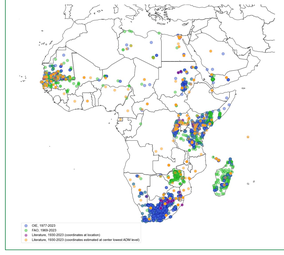
Georeferenced Data



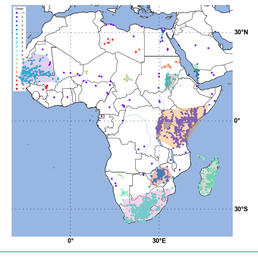
Spatial and Temporal Distribution of RVf



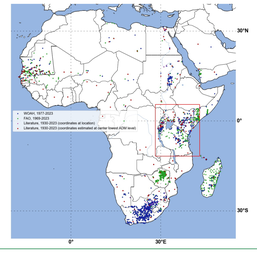
RVf Historical Reports



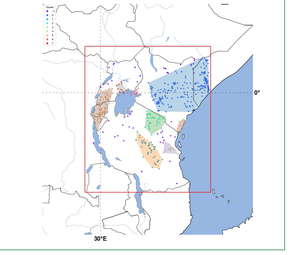
RVf Outbreak Zones



RVf in Eastern Africa

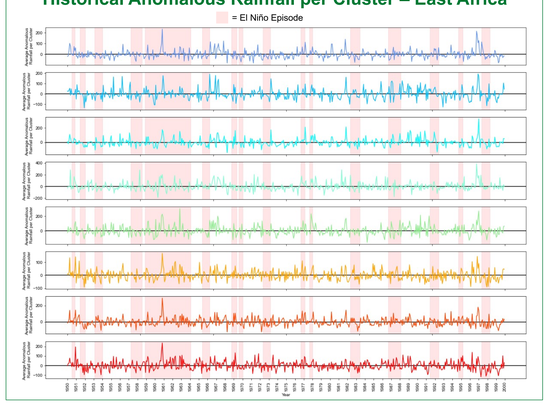


Eastern Africa Outbreak Zones



Conclusions

Historical Anomalous Rainfall per Cluster – East Africa



Acknowledgements

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3. WOAH WAHIS Interface. [online] URL: https://www.woah.org/en/what-we-do/animal-health-and-welfare/disease-data-collection/world-animal-health-information-system/
4. Ester, M., Kriegel, H. P., Sander, J., & Xu, X. (1996). A density-based algorithm for discovering clusters in large spatial databases with noise.