Deutsches Fernerkundungs-datenzentrum

Enhancing Earth Observation of Migration with Insights from Social Media

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MOTIVATION

Insights into migrants' movements and perceptions

Complex migration processes are pervasive on the African continent and are intrinsically linked to ongoing demographic, social, economic, and ecological changes[1]. To better understand the complexity of these processes, there is a need for more and better data and knowledge on the flows, the drivers, and the effects of migration.

Earth Observation is increasingly able to accurately map drivers and effects of migration which have a visible impact on the earth's surface. Such drivers are e.g. floods, droughts, and effect are e.g. refugee camps or urban expansion (top image: Sentinel-2 based maps of the migration induced urban growth in Abuja and Maiduguri, which takes the form of low-dense urban development and refugee camps).

However, underlying socio-economic and political drivers as well as individuals' subjective decisions or perceptions of situations and the environment can not be directly mapped using Earth Observation sensors. In this project we aim to reduce these knowledge gaps by additional data sources. In this context, geolocated social media data can provide valuable insights into migrant's movements and motivations.
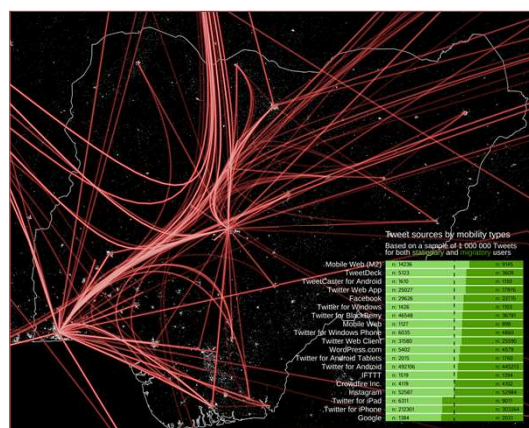
DATA & METHODS

Figure 1: Migration flows in Nigeria as detected in users' geolocations, 2015-2019 (Basemap: World Settlement Footprint, DLR). Bottom right: Comparison of device use by users which have migrated at least once within the timeframe versus stationary users (Data: Twitter Inc.)

Aspects and uses of Twitter data

Twitter data provide three types of information:

- **Geolocation**, which can be used to map concentrations and movements of people. We algorithmically[2] detect relocations in users' geolocation histories and aggregate them into **migration flows**.

- **Metadata** on language, device use, and connectedness, which can inform about the demographics of migrants and their social integration. As an example, we show the **device use** of migrants and stationary users.

- **Content**, from which keywords, topics, and sentiments can be extracted. As an example, we extract prevalence of **keywords** which relate to **floods**, a push factor contributing to migration.
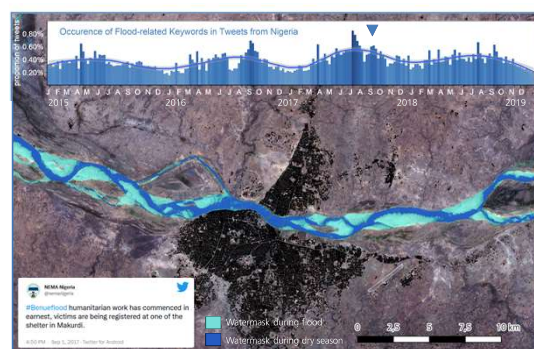
FINDINGS

Figure 2: The 2017 Benue state flooding through the lenses of Twitter and Remote Sensing (Basemap: Sentinel-2 Mosaic, Watermask: Sentinel-1; Urban Areas: World Settlement Footprint)

Results

- **Geolocation**: 48.5% of Nigerian users' relocations are international, connecting Nigeria to the US and the UK. Most migrations within Nigeria connect the cities Lagos, Abuja, and Ibadan.

- **Metadata**: iPhones and iPads tend to be disproportionately used by migratory users.

- **Content**: Rainy seasons and the accompanying floods are reflected in the online discussion. Floods which affect urban areas receive significant attention.

Limitations and Outlook

The demographic of twitter users is biased towards young and urban users[3]. To tackle this limitation, future efforts will involve transferring insights from and to other data sources, such as news and interviews.

ACKNOWLEDGEMENTS

[1] Steinbrink, Malte, and Hannah Niedenführ. "Africa on the Move". Springer International Publishing, 2020.

[2] Chi, Guanghua, et al. "A general approach to detecting migration events in digital trace data." PloS one 15.10 (2020): e0239408.

[3] Blanchard, Paul, Douglas Gollin, and Martina Kirchberger. "Perpetual Motion: Human Mobility and Spatial Frictions in Three African Countries." (2021).