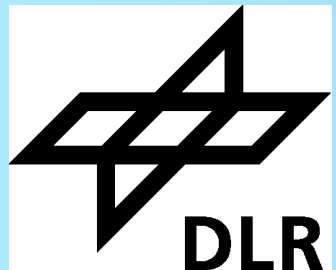# Capturing Patterns and Radical Changes in Long-Distance Mobility by Flickr Data

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DLR

BACKGROUND

Lack of data on long-distance mobility and continuous data

- National household travel surveys mainly cover daily mobility
  - Participants fill out travel diaries for a specific day
  - Long-distance trips such as holiday trips are not covered at all or only in minor sections of the questionnaire

- Largest travel survey in Germany: Mobility in Germany 2017
  - 316,361 participants provided information on daily mobility for 960,619 trips
  - Subsample of 20,454 participants provided information on 38,905 long-distance trips
  - No information on travel behaviour at the destination

- Travel surveys provide static data
  - Difficult to capture abrupt changes in travel behaviour
  - Difficult to capture variations in travel behaviour

Social media as a source of data for transportation research?

- Studies in different countries have used **X data** (former Twitter) for:

  - **„Event detection"**: Identification of accidents or major events
    (Gu et al. 2016, Xu et al. 2018)

  - **Prediction of traffic jams** in the morning rush hour
    (Yao and Qian 2021)

  - **Derivation of points of interest** (place of residence, place of work etc.)
    (Rashidi et al. 2017, van Eggermond et al. 2015)

  - **Calculation of trip lengths** between points of interest and comparison to national household travel surveys
    (Rashidi et al. 2017, van Eggermond et al. 2015)

Traffic incidents derived from Twitter data and according to official statistics

(a) Pittsburgh (b) Philadelphia
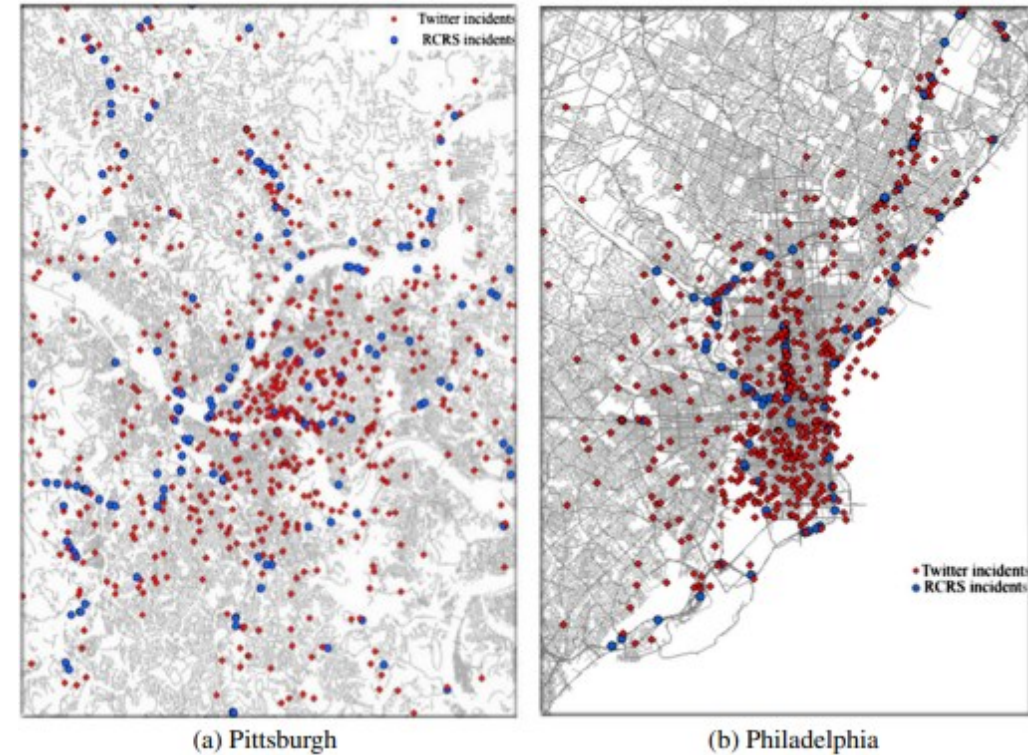
Gu et al. 2016

Flickr – Introduction

- **Social media platform** where the users can **share photos**

- Mainly used for sharing pictures from holidays

- Photos are uploaded with
  - **Latitude** and **longitude coordinates**
  - **Date** and **time**
  - **User ID**
  - **Comments** and **descriptions**
  - ...

- Data is accessible via a **public API**: https://www.flickr.com/services/api/

Glen of Aherlow, Caravan & Camping Park Co., Tipperary, Ireland by Flickr user Uwe Sacher


Lighttower on the German island of Sylt by Flickr user Arne Jensen _Jojoracer

Social media as a source of data for transportation research?

- **Flickr data** has been used for:

  - **Identification of popular tourist attractions**
    (Vaziri et al. 2020, Spyrou et al. 2015)

  - **Estimatation of visitor trajectories in world heritage cities**
    (Domènech et al. 2020)

  - **Analysis of international travel behaviour**
    (Yuan and Medel 2016, Barchiesi et al. 2015, Preis et al. 2020)

  - **Prediction of national air travel**
    (Beiró et al. 2016)

Deriving international travel from Flickr data
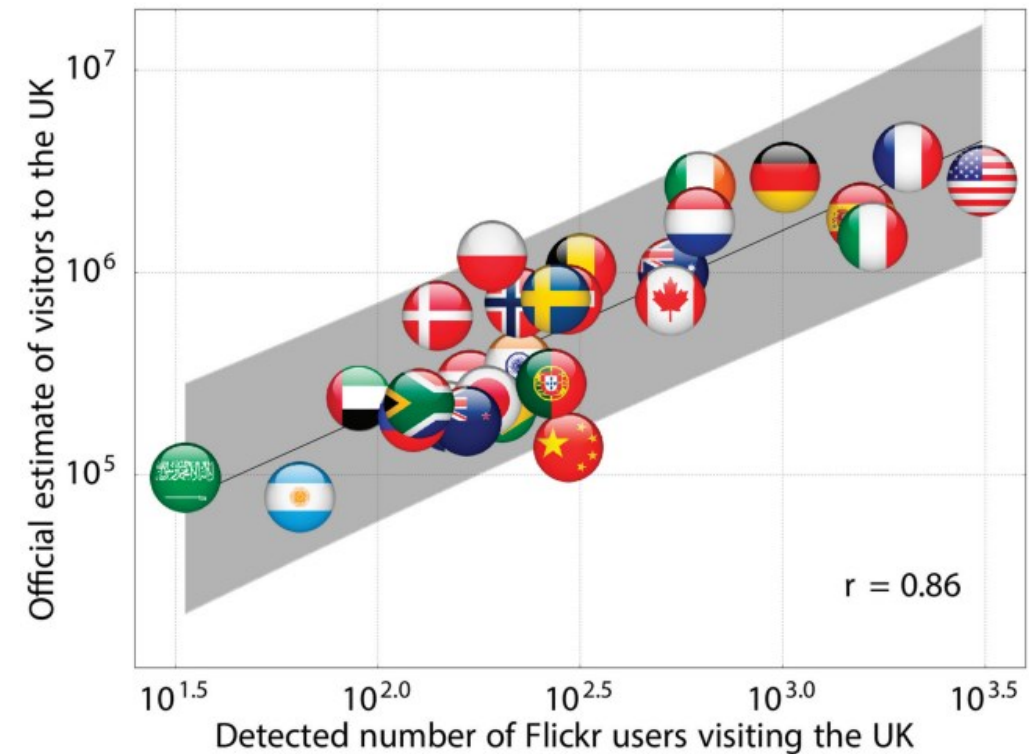
Barchiesi et al. 2015

OBJECTIVES, DATA, METHODS

Study design

DLR

- **Research question**
 - Can Flickr data be used for the analysis of long-distance mobility?

- **Data**
  - Downloaded via the Flickr API
  - All geographic locations of the photos taken between 00:00AM 01.01.2017 and 12:00pm 31.12.2021 by users residing in Germany
  - 9,029 geo-referenced photos of 518 users

- **Methods**
  - Data processing to determine places of residence, destinations, trip lengths, etc.
  - Comparison with more established sources of data on the basis of key indicators

Geo-referenced locations of the photos taken between 00:00am 01.01.2017 and 12:00pm 31.12.2021 and uploaded by Flickr users residing in Germany
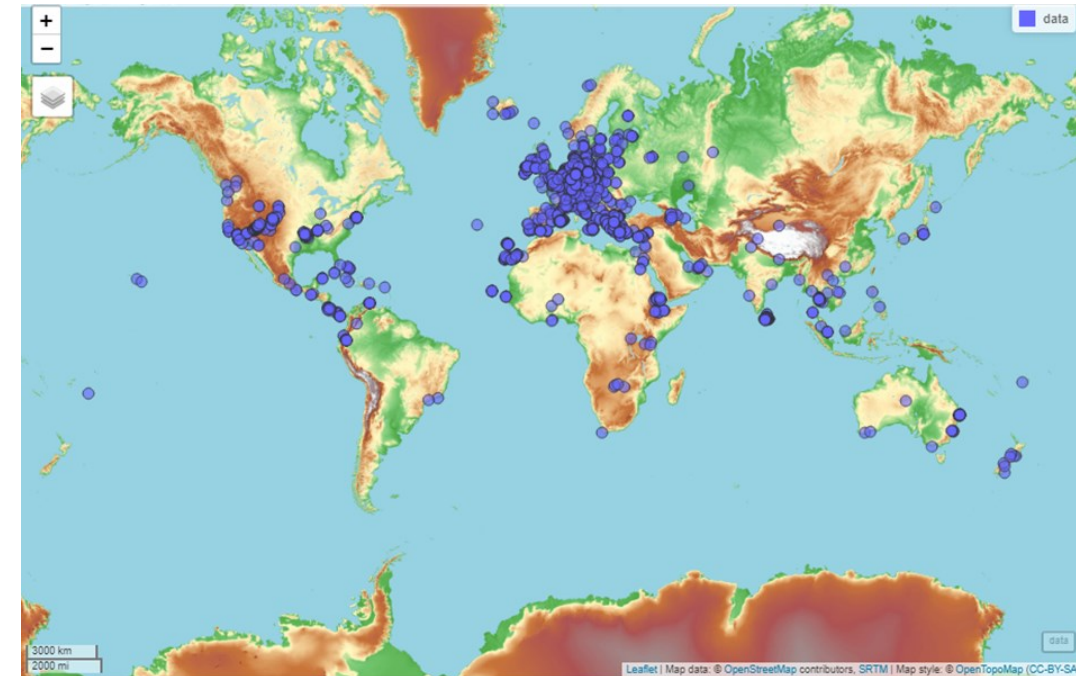
Flickr – Data processing

- Determination of the **coordinates of the place of residence** (Nomatim search engine)

- **Spatial & temporal clustering** of the coordinates of the photos

- **Mapping on country borders**

- **Calculation of trip length** from the place of residence to the destination

- Calculation of **radius of movement** at the destination

Illustration of the spatially clustered locations of the photos uploaded by one user
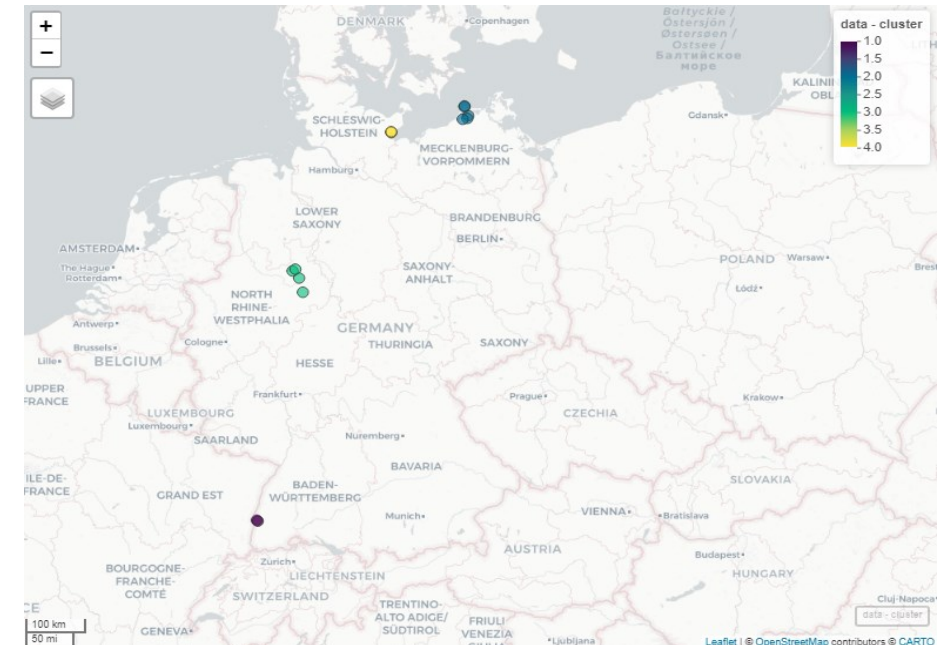
Data sources for validation

- **Mobility in Germany 2017**
  - Largest travel survey in Germany
  - Used for the comparison of trip lengths of long-distance trips

- **Air traffic statistics**
  - Federal Statistical Office of Germany
  - Number of passengers boarding an airplane at any airport in Germany per year and country of destination
  - Used for the comparison of travel destinations

- **Transport in Figures**
  - Central reference for annual statistics on transport in Germany ("Verkehr in Zahlen")
 - Used for the comparison of the change in travel behaviour from 2019 to 2020

RESULTS

Comparison of trip length to the destination with national household travel survey

- Distribution of the travel distances is relatively similar

- Considerably more long trips of at least 2,000km in the Flickr data

- This might rely on the sociodemographic background of the Flickr users

- However, no sociodemographic information on the Flickr users available

Distances travelled in the MiD 2017 and the Flickr data
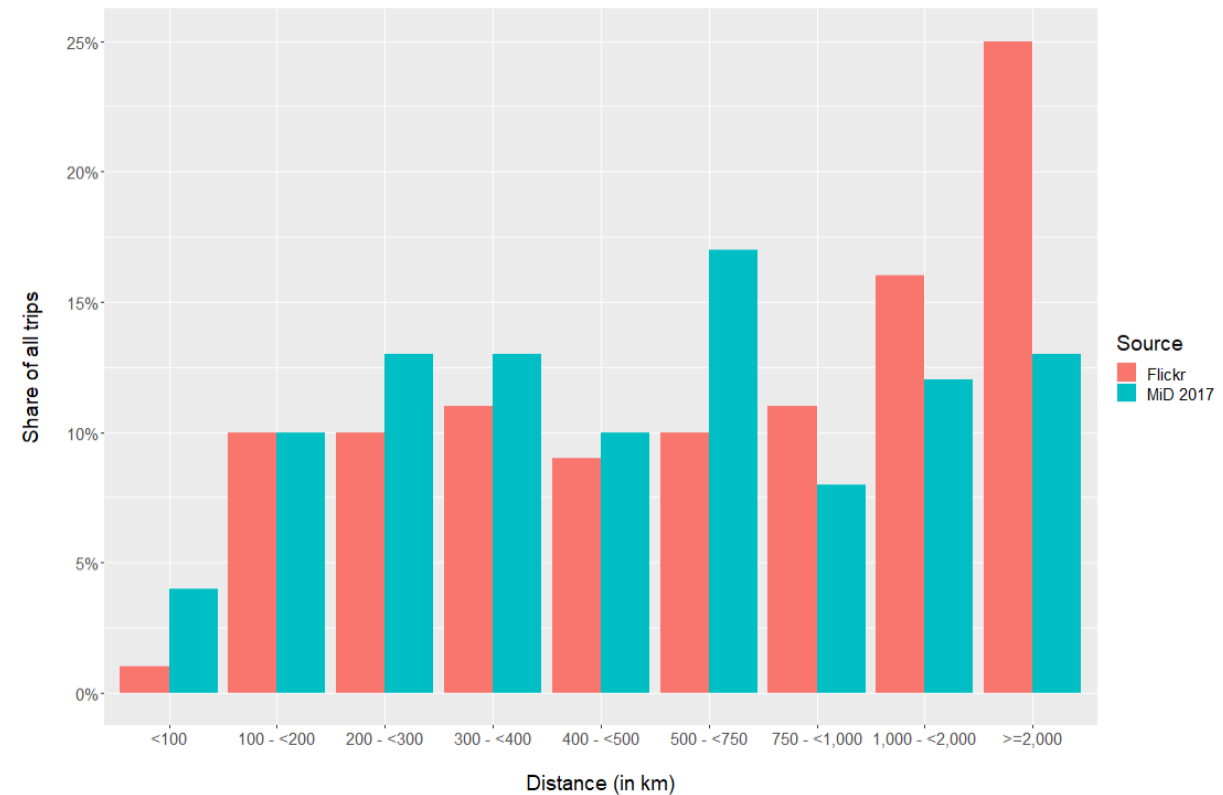
Comparison of the regions of destination with air traffic statistics

- Share of destinations relatively similar in 2017

- The differences increase in 2018 and 2019

- More Flickr users travelling within Germany, fewer to other European countries

- The Flickr data also contain trips by car or public transport

- This might explain the higher share of shorter trips within Germany

**Share of trips per destination region and year**
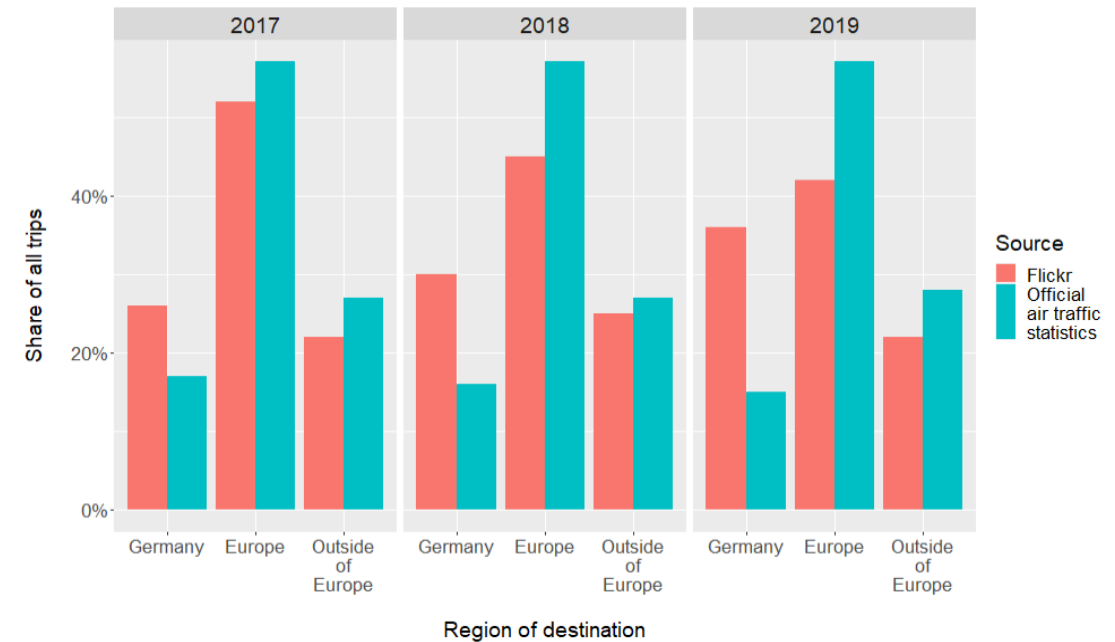
Change in the distances travelled from 2019 to 2020

- **Decrease in the distances travelled from 2019 to 2020**
  - Flickr: 57%
  - Transport in Figures: 47%

- **Background**
  - Outbreak of the COVID19-pandemic in 2020
  - Introduction of a lockdown in March 2020 in Germany

- **The larger decrease in the Flickr data might rely on the longer distances travelled in usual years**

Locations of the photos taken in 2019 from 01 April onwards
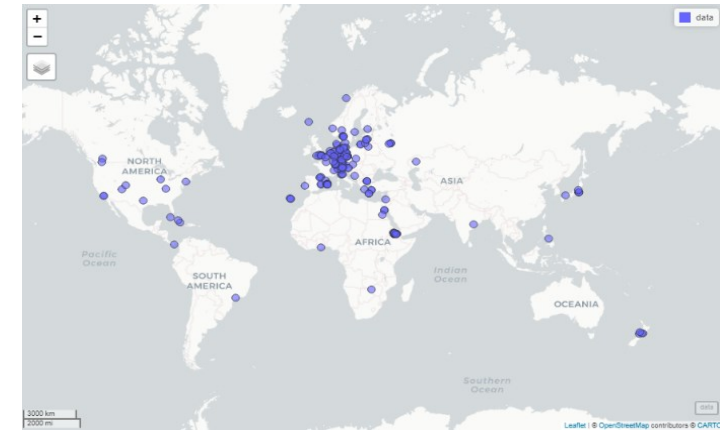
Locations of the photos taken in 2020 from 01 April onwards

# Radius of movement at the destination in the Flickr data

- Radius of movement is shorter than 16km at 73% of the destinations

- Radius of movement at the destination **does not correlate** with trip length to the destination

- Short radius of movement illustrates potential for sustainable modes of transport at the destination

Share of all trips by maximum distance travelled at the destination
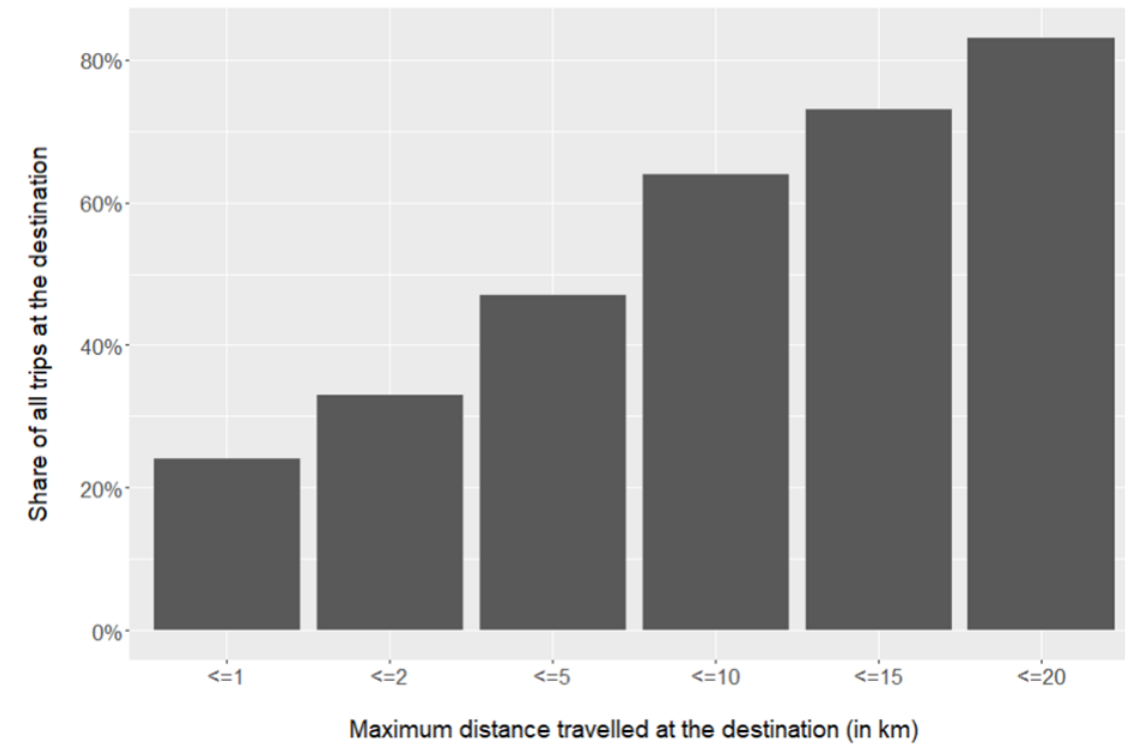
CONCLUSIONS

Conclusions

- Flickr data can be a useful supplement of other sources of data for the analysis of long-distance mobility

- However, uncertainties about the completeness of the data provided by the Flickr API remain

- More transparency on social media data provided via public APIs is needed
    - Is the data of all users or only of a sample accessible?
    - How was the sample drawn?
    - More data on the sociodemographic background of the users (if collected)
    - …

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Many thanks for your attention!

https://github.com/antonlich/flickr_longdistance_mobility.git