Tracking clinically active vibrios using earth observations

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Epidemic Cholera
- Sporadic deadly outbreak
- Usually occurs following floods or inundation of large landscape
- Warm temperatures may increase growth of bacteria in aquatic bodies.

Mixed-mode Cholera
- Usually two seasonal peaks
- One peak related to seawater intrusion; Second peak associated with widespread inundation
- Specific to Bengal Delta region

Endemic Cholera
- Cholera persists throughout year in coastal regions
- Seawater intrusion from coasts to inland
- Cholera outbreaks occur during low river flow season

Bacterial movement from coastal niches to inland

Satellites data and products
- LANDSAT: ▲▲
  - Land Use, NDVI
- MODIS/ MERIS: ▲▲▲
  - Surface Temperature, Ocean Color
- SWOT: ▲▲▲
  - River Discharge
- GRACE: ▲▲▲
  - Water Storage, River Discharge
- TRMM/GPM: ▲▲
  - Precipitation
- TOPEX/JASON: ▲▲
  - Sea Surface Height
- AVHRR: ▲▲
  - Sea surface temperature
Epidemic Cholera

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Prediction of October 2015 cholera depending on Hurricane Matthew severity

Real-time cholera prediction for Yemen
Abundance of *Vibrio vulnificus*, *Vibrio parahaemolyticus* in Chesapeake Bay

Chester River (CR)

Tangier Sound (TS)
Distribution of *Vibrio vulnificus*, *Vibrio parahaemolyticus* in Chesapeake Bay

Chester River (CR)

Tangier Sound (TS)
Vibrio vulnificus, Vibrio parahaemolyticus in Chesapeake Bay

Chester River (CR)

Tangier Sound (TS)
Thank you.

- https://www.youtube.com/watch?v=Gf9iww8YhSY
Time period for opportunity to predict water-borne infections

- **High infection risk**
  - Initiate Satellite Monitoring (Weeks)
  - Natural Disaster

- **Low infection risk**
  - Societal response
    - WASH=Damaged and population displaced
  - Societal response
    - WASH=reconstructed and population resettled