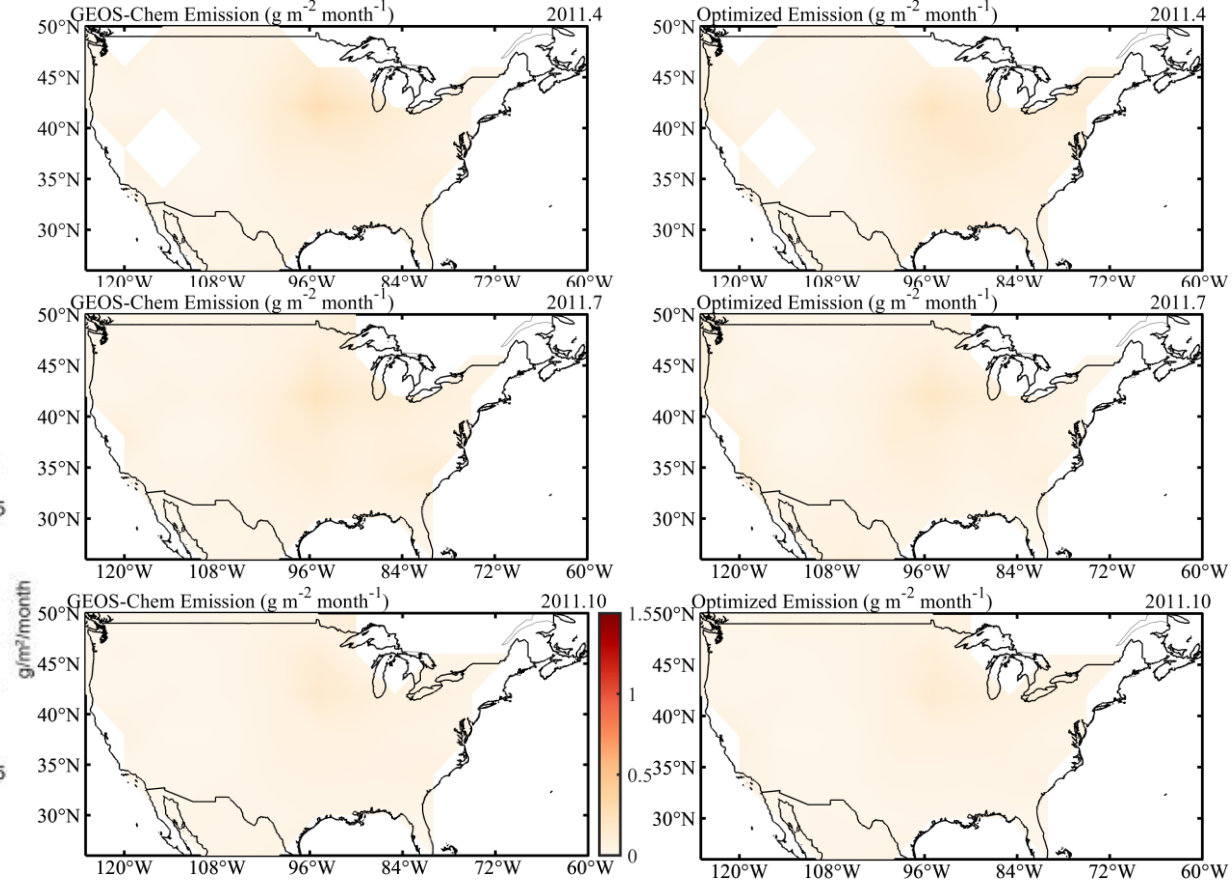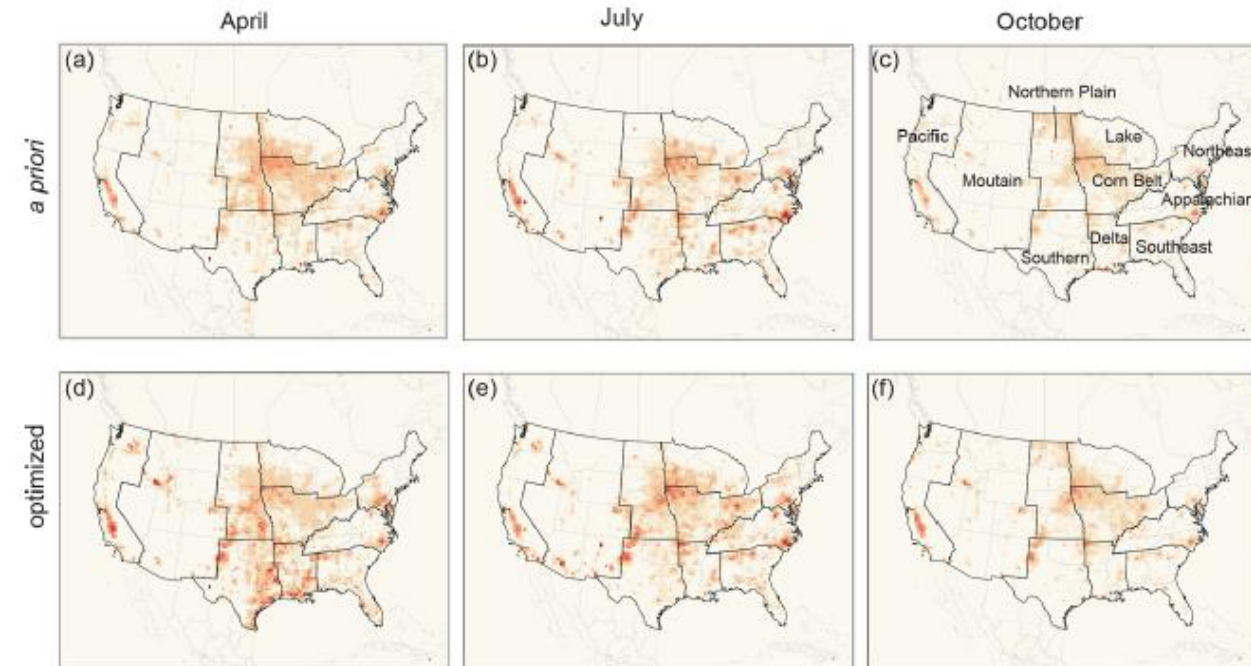# NH3 over USA, India and China

Zhenqi Luo   2021.5

Progress & Plan

- 1. Compare with other studies
    - US
- 2. Compare with independent dataset
   - FAOSTAT

Analysis

(Chen et al., 2021)

| (Gg)	2011.4	2011.7	2011.10
2011 NEI	462	475	304
Chen et al optimized	623	564	335
increase	35%	19%	10%
GEOS-Chem	572	682	395
Our study	684	707	395
increase	20%	4%	0%

litreature

Atmospheric NH3 over India, 2008-2016

- source
  - agricultural activities——major source (80% in Asia)
    - animal husbandry
    - nitrogenous fertilizers
    - manure management
    - soil and water management practices
  - biomass burning——the second-largest contributor (13-16%)

- space instruments
  - AIRS——2002~
  - IASI——2006~
    - ANNI-NH3-v2.2R-I
    - 9.30 AM
  - CriS——2011~
  - TANSO–FTS——2018~
  - TES——2004~

- Indo-Gangetic Plains (IGP)——NH3 emission hotspot
  - Zaid (March-May, MAM)——pre-monsoon
  - Kharif (June–September, JJAS)——monsoon
  - Rabi (October–February, ONDJF)——post-monsoon

- Other data
  - PM——NAMP/CPCB
  - Rainfall——IMD
  - Total fertilizer consumption——the fertilizer association of India
  - fire count——MODIS
  - meteorology——ERAI
  - Population——Indian Population Census 2011

IASI average NH3 distribution over **Asia** (Van Damme et al., 2018) *Nature*
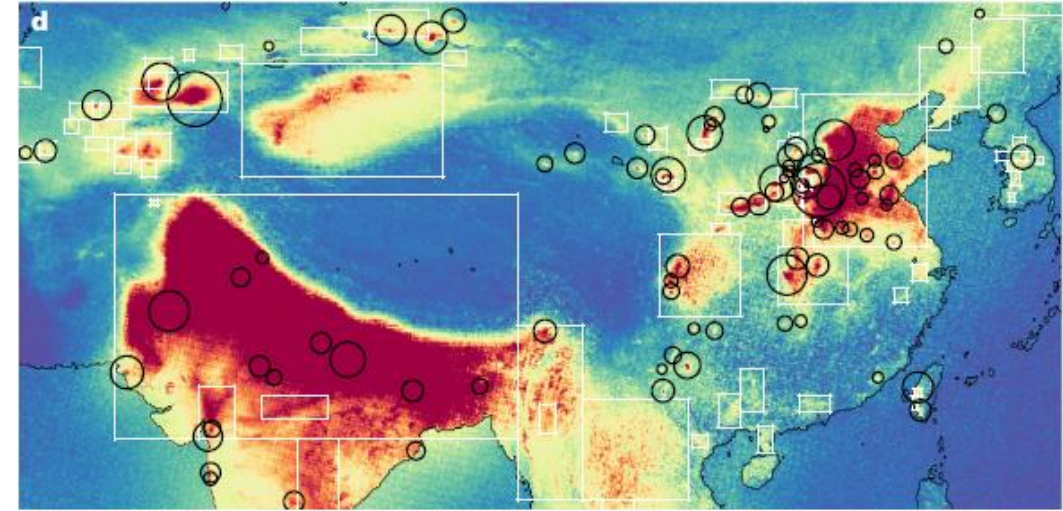
IASI 2008.5.13 distribution over **India and Pakistan** (Clarisse et al., 2009) *Nature Geoscience*
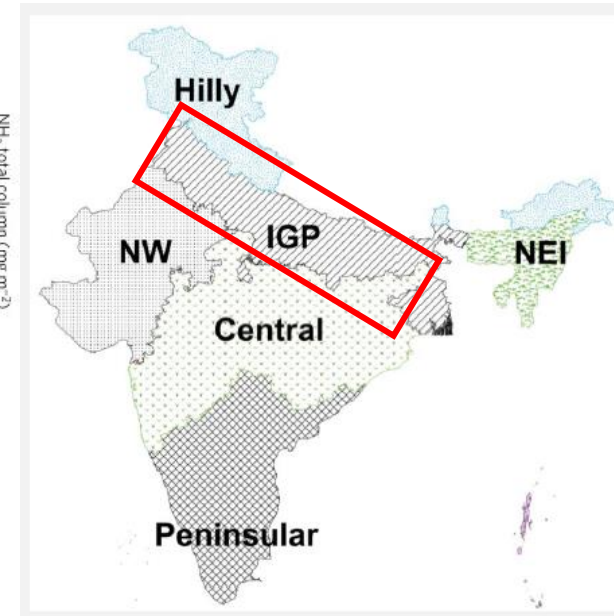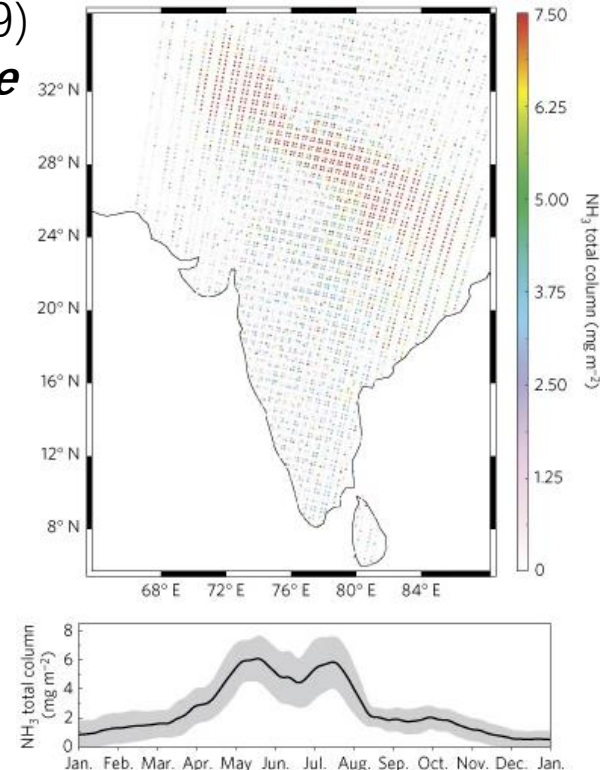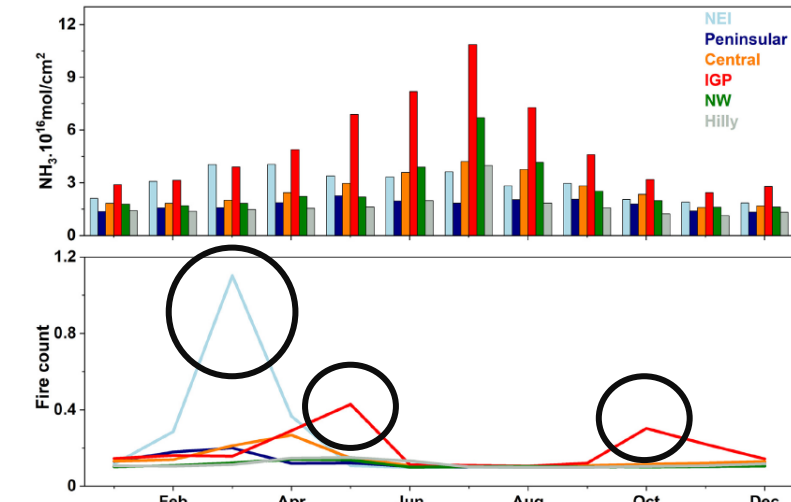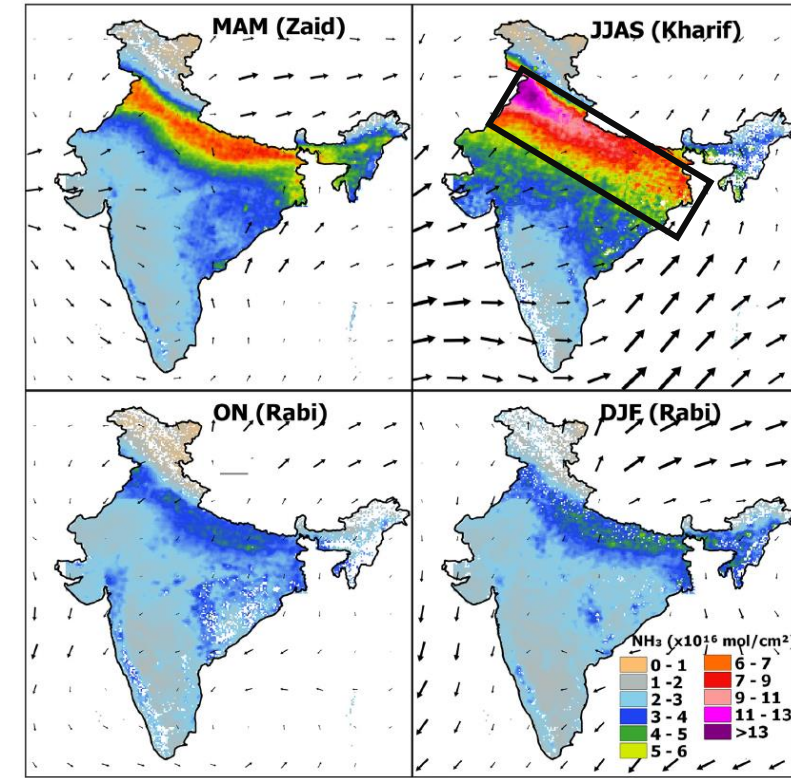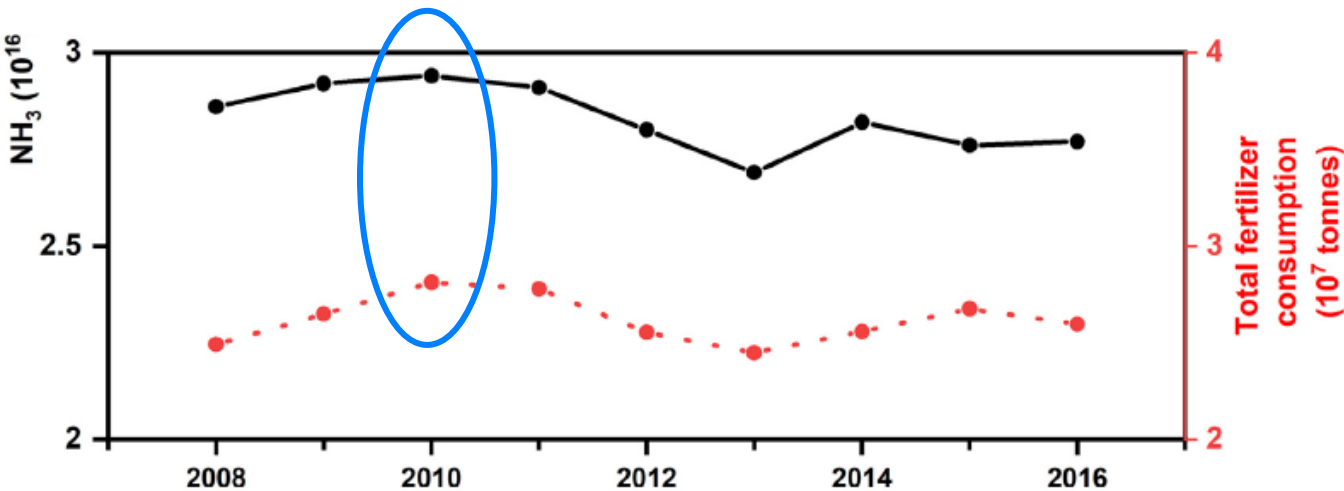

(Kuttippurath et al., 2020)

Atmospheric NH3 over India, 2008-2016

- Seasonal changes
  - IGP: the largest NH3 concentrations
  - large seasonal variability
  - different agriculture intensive regions
  - fire counts
    - the northeast regions: in spring
    - IGP: double peak

- Inter-annual variability
  - 2010: the highest

(Kuttippurath et al., 2020)

Atmospheric NH3 over India, 2008-2016
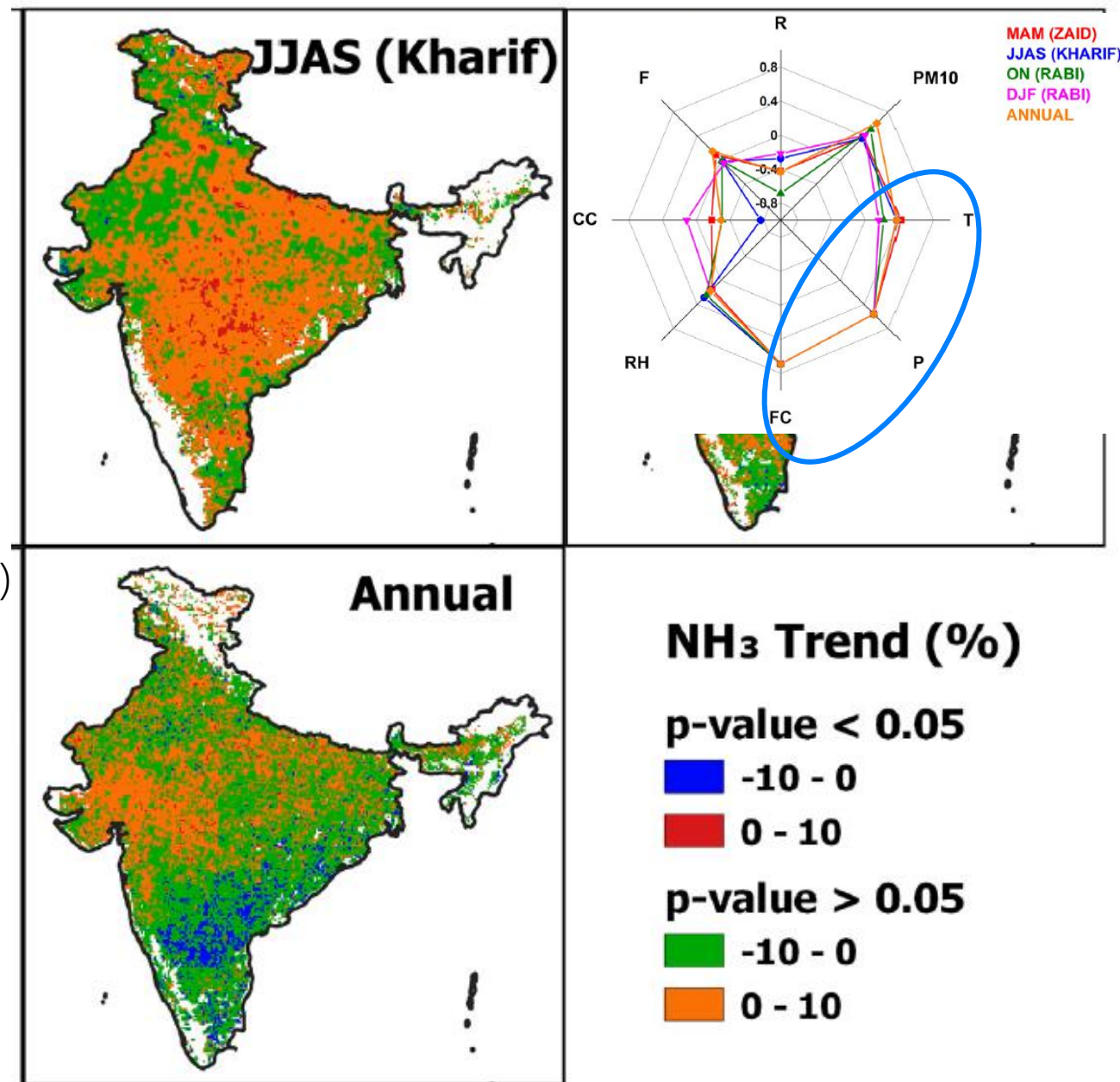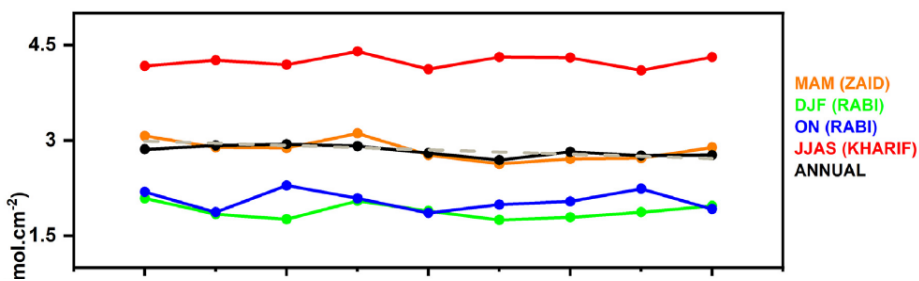
- Impact——JJAS
  - meteorological factors
    - Precipitation
    - Temperature
  - socio-economic factors
    - Fertilizer consumption
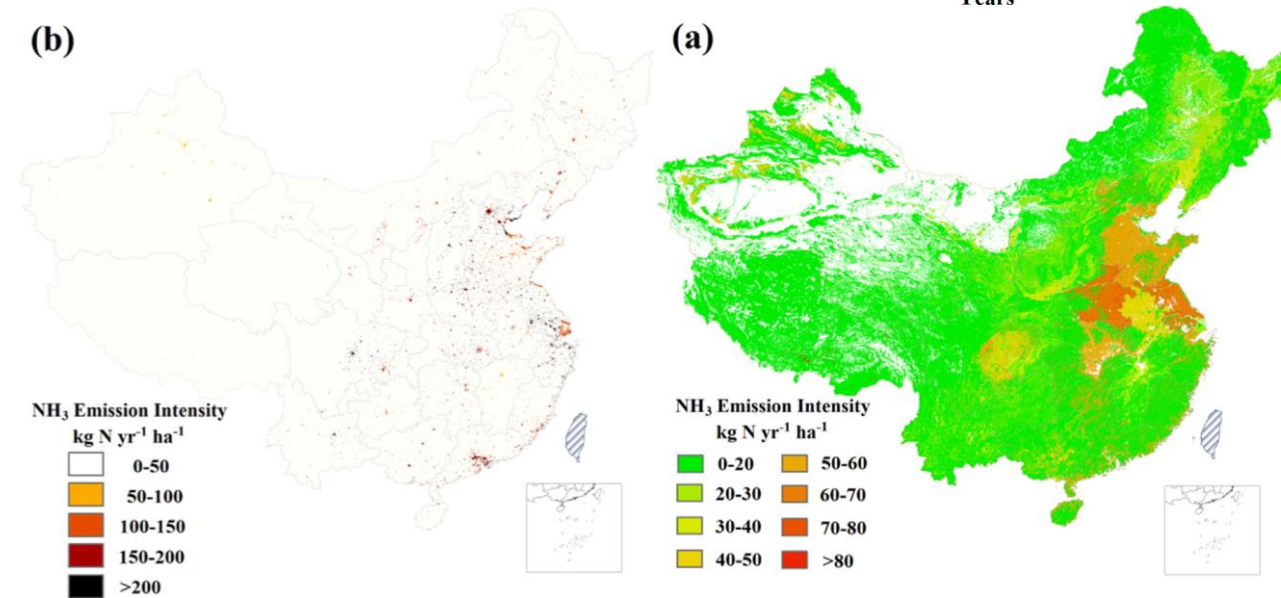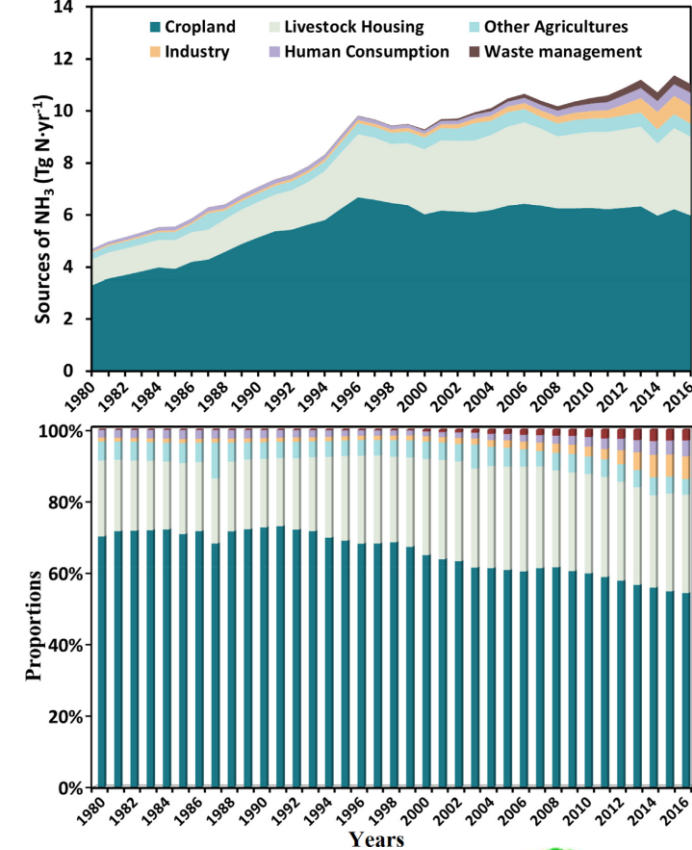- Trends (Kuttippurath et al., 2020)
  - JJAS: insignificant positive
  - ONDJF: insignificant negative
  - MAM: significant negative

NH3 emission in China

- policies and strategies——eliminate haze and ameliorate air quality
  - the Blue Sky Protection Campaign
  - the Air Pollution Prevention and Control Action Plan
- Model——coupled human-environment N cycle (CHEN)
  - E = EF × A
    - E: total NH3 emissions
    - EF: emission factor
    - A: activity data
- Data:
  - statistical yearbooks and databases
  - national resource survey statistics
  - literature
  - spatial information models
- Temporal evolution
  - Major are high: > 80%
  - Minor proportion are increasing: 9% -> 19%
- Spatial variations
  - agriculture
  - nonagriculture

(Fu et al., 2020)

Questions?