AGENDA

Air Quality Health Monitoring Task Force
Initial Meeting
Transportation Council Room, NCTCOG
Friday, December 20, 2019
10:30 a.m. – 12:00 p.m.

Conference Line: 1-888-909-7654
Participant PIN: 504571#

1. Welcome and Introductions .... Lori Clark, NCTCOG
2. Project Goals and Objectives............................ Lori Clark & Dorothy Gilliam, NCTCOG
3. Project Update from UTA..Dr. Stephen Mattingly
4. Discussion from Local Governments on AQ Monitoring Projects
   - City of Plano
   - City of Dallas
5. Brief Overview of Regional AQ Monitoring Projects……………Dr. David Lary
6. Miscellaneous
   - Proposed 2020 Meeting Dates/Times
     Hosted at NCTCOG
     Meeting Time: 9:30 – 11:00 am
     - Tuesday, February 18
     - Friday, May 29
     - Tuesday, August 25
     - Tuesday, December 15
   - NYC Health Department: The Public Health Impacts of PM 2.5 from Traffic Air Pollution
     http://a816-dohbesp.nyc.gov/IndicatorPublic/traffic/index.html

Help Grow the **Texas Asthma Control Program**!

The Texas Asthma Control Program (TACP) at the Texas Department of State Health Services (DSHS) is reinstating the Texas Asthma Control Collaborative (TACC). TACC is a statewide, multi-sector group of asthma stakeholders who will work together to reduce the burden of asthma in Texas and provide input for the 2020-2025 Texas Asthma Control Strategic Plan.

Program activities will include reestablishing the Texas Asthma Control Collaborative (a statewide partnership of asthma control stakeholders), developing a statewide strategic plan, and building local/regional capacity to address adult and childhood asthma in high burden areas. The TACP will also build upon the work of the current Childhood Asthma Surveillance and Control Project, which looks at the impact of Hurricane Harvey on childhood asthma prevalence and complications in affected areas.

The funded work plan revolves around establishing and leveraging partnerships to implement the **CDC's EXHALE** framework in high burden areas of the state:

- **E**ducation on asthma self-management (AS-ME)
- **X**-tinguishing smoking and secondhand smoke
- **H**ome visits for trigger reduction and AS-ME
- **A**chievement of guidelines-based medical management
- **L**inkages and coordination of care across settings
- **E**nvironmental policies or best practices to reduce asthma triggers from indoor, outdoor, and occupational sources

Interested in joining the TACP stakeholder list? Email asthma@dshs.texas.gov or visit the website at dshs.texas.gov/asthma.

AQ Health Monitoring Task Force – Initial Meeting Notes

Friday December 20, 2019
10:30am – 12:00pm

Meeting Attendees	
Name	Organization
Kevin Overton	City of Dallas
Katherine Barnett	City of Denton
Zoe Bolack	DFW Airport
Emily Asbury	City of Irving
Mendie White (remote attendance)	City of Lewisville
Kathy Fonville (remote attendance)	City of Mesquite
Yarcus Lewis	City of Plano
Stephen Mattingly	UT Arlington
Erin Moore	Dallas County
David Lary	UT Dallas
Sam Adame (unsure if spelled correctly)	Tarrant County Health Department
Lori Clark	NCTCOG
Chris Klaus	NCTCOG
Vivek Thimmavajjhala	NCTCOG
Nicholas Vanhaasen	NCTCOG
Kate Zielke	NCTCOG
Abhijit Basu	SmartEx
Heather Bertero (remote attendance)	DSHS
Joe Zietsman (remote attendance)	TTI

Discussion of Project Goals/Objectives:

Who is missing from the conversation today?

- Health falls under the responsibility of the counties (generally speaking) it would be wise to include the counties on this discussion
- Inclusion of big data experts/champions, such as Google, General Motors (GM), Health Representatives, etc. to determine pre-existing data for future planning efforts (smart city components) rather than just relying on more monitors
  Discussion regarding other organizations to include (see table also under "Next Steps/Action Items"

What is the need or problem we're trying to address?

- Motivations/Concerns by Participating Local Governments Included:
  - Transportation related problems and growth will cause implications; we must be proactive now to address those challenges
  - Important to consider equity; finding the distribution of where people live and where air quality is poor
  - When we build infrastructure for active transportation, need to consider if/where people are active in areas of poor air quality that can cause impacts. There is a need for localized monitors to assess the AQ

- From a local government perspective, air quality is controversial, and it could be advantageous to approach this issue from a health and equity standpoint to better communicate these issues
- The importance of regulation to make change and building out capacity for cities.
- Growth problems (urban sprawl)

What are the key indicators of improvement?

- Keeping readmission rates down is something hospitals are supposed to do

What technologies can address the need? What is the solution?

- Maintaining low-cost monitors is hard if you don't have the resources. Working with EPA for performance targets of ozone and particulate matter - Summer 2020 these performance targets are expected to roll out
  - Consider monitoring closer to gas wells and gas well drilling sites
  - Important to delineate between the 20 regulatory monitors in our region and the non-regulatory monitors in our region (non-regulatory are smaller and more portable)
  - The interest of this task force is focused mostly on non-regulatory portable monitors
  - On a local level, what is the population dealing with? What pollutants are an issue for them? Once determined then you can address the equity issue.

What other Local Govt's/Entities are doing?

- **City of Plano – Yarcus Lewis:** Contracted AQ monitoring with UTD to build and deploy 50 monitors. All of this is hyperlocal due to interest in local impacts

- **City of Dallas – Kevin Overton:** Installed a new particulate matter (PM) regulatory monitor by the southside water treatment plant (WTP). Currently it is on hold because it's in a floodplain and the monitor must be approved by the Army Corps of Engineers. Only a PM monitor but will be useful in picking up data from environmental justice (EJ) communities in South Dallas.

- **Texas Asthma Control Program (TACP) – Heather Bertero:** DSHS was awarded a grant to reinstate this program. DSHS does not have a dataset of asthma incidences by zip but in the future they plan is to look at asthma rates related to ozone monitor locations.

- **Project Update from UTA – Dr. Mattingly:** Looking at chronic health affects (not acute), looking at health impacts and disproportionately impacted communities. Create socio-economic profiles and indicators of health risks due to AQ. The demographic characteristics are the most important determinate for aggregate respiratory disease and then transit access to jobs is the second most important.

Next Steps & Action Items

NCTCOG will:

- Add additional relevant stakeholders to interested parties list for future meetings
- Draft a work plan for task force members to weigh-in on
- Future Step: Bring near-road monitoring data into this group's discussion at a later point

All attendees:

- Please help fill in the highlighted cells, and add any additional participants who should be added to future meetings:

Representatives Recommended to be invited to future Task Force Meetings		
Name	**Organization**	**Contact Information**
Dorothy Crawford	EPA Region 6	
Carrie Paige	EPA Region 6	On file at NCTCOG
Jackie Ploch	TXDOT Environmental Division	On file at NCTCOG
Roadway/Mobility Plan Team Rep	NCTCOG	On file at NCTCOG
(representative)	American Lung Association	
Dr. James Lepage	UT Southwestern	
	Big Data Reps – e.g. Google, etc. – what "big data" groups have relevant info?	
Maia Draper (?)	Environmental Defense Fund (data from Google roadway project)	

- Mark your calendars for the next meeting dates:

  Updated 2020 Quarterly Meeting Schedule

  Meeting Length: 2hrs
  Location: NCTCOG
  Meeting Time: 9:30 am - 11:30 am
  - Friday, February 21
  - Friday, May 29
  - Friday, August 21
  - Friday, November 6

Follow-up items:

- **"SharedAirDFW" UT Dallas Initiative:** http://mintsdata.utdallas.edu:8084/
- **Video, "Air Intuition" American Association for Aerosol Research:** https://vimeo.com/287938804

Topics for future meetings (lead to be determined):

- Develop a GIS map of hospitals/ asthma incidences and address the highly impacted areas. If possible, overlay temporal information with existing monitoring data.
- (new) Immunization rates, success, etc?
- Need for asthma/health data – bring hospitals and health representatives to the table
- How do asthma prevalence rates vary by county – comparing North Texas to the rest of Texas

Air Quality Health Monitoring Task Force - Kickoff Meeting

North Central Texas Council of Governments

December 20, 2019

North Central Texas
Council of Governments

Goals & Objectives

Engage Appropriate Participants – Who are we missing?

Transportation
Air Quality
Health

Local Governments
Academia/Research Institutions
Health Experts
State/Federal Agencies

Is there a need? What is the problem?

What are the key indicators of improvement?

What technologies can address the need? What is the solution?

What are the near-term and future steps?

North Central Texas
Council of Governments

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www.nctcog.org/airquality

North Central Texas
Council of Governments

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Western Michigan University | University of Texas at Arlington| Utah State University | Wayne State University | Tennessee State University

UNIVERSITY OF TEXAS ARLINGTON
CIVIL ENGINEERING

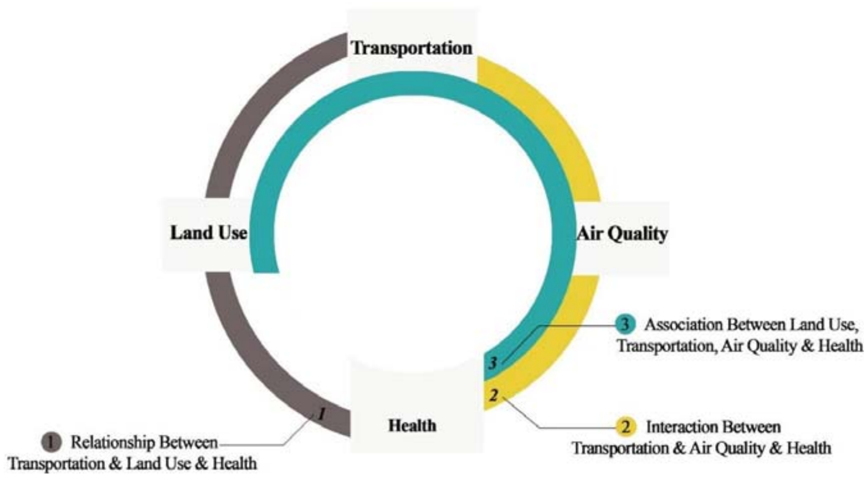
AIR QUALITY MONITORING STRATEGIES AND MODELING OF CHRONIC HEALTH RISKS RELATED TO TRAFFIC-RELATED AIR POLLUTION

Dr. Stephen P Mattingly
Dr. Kate Hyun
With
Shirin Kamali Rad

MOTIVATION

- Exposure to air pollutants varies significantly based on a **household's location** within an urban area
  - **Disproportionately** impact particular communities
  - Contribute to higher rates of morbidity and mortality in these communities
- Studies indicate that subjects **living adjacent to major roads** more likely suffer **adverse** health effects and respiratory diseases such as asthma, and cardiovascular diseases (HEI, 2010)
- **Not all citizens can afford to select** locations to live and work based on the health risks imposed by nearby traffic.
  - Populations living, working, or going to school near major roads may be subjected to an increased risk for several adverse health effects such as respiratory, cardiovascular, low birth weight and cancer (Adar and Kaufman, 2007).
  - Community level air pollution exposures allows policy makers and elected officials to reduce disproportionately impacts

BACKGROUND AND SIGNIFICANCE

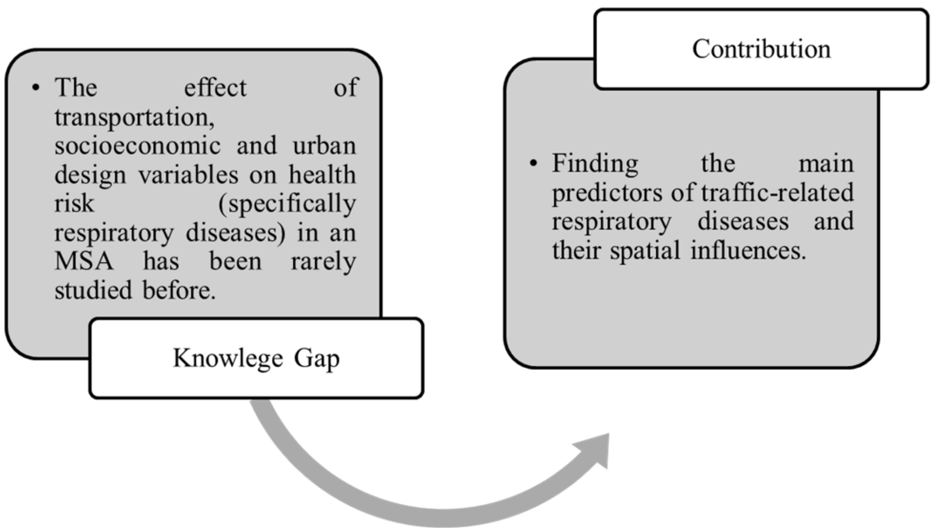


Three Main Mechanisms in Literature Review

- Public health outcomes related to transportation intersect with
  - Built environment (land use)
  - Air quality
- 3 Primary Research approaches
  - Linkages between transportation, land use, and health
  - Linkages between transportation, regional air quality, and health
  - All four dimensions (land use, transportation, air quality and health) together

RESEARCH GAP

- While some studies have investigated the relationship between socioeconomic or land use variables and developed models to quantify the effect of these variables, the impact of all these factors on health status while considering geographic influence in a metropolitan statistical area (MSA) remains rarely studied.



Research Elements

RESEARCH OBJECTIVES: MONITORING

- Explore the state-of-the-art and state-of-the-practice strategies for **crowd-sourced or dispersed air quality monitoring**
  - CARB air quality monitoring network
  - Utah air quality monitoring network
  - Technologies available
    - Accuracy
    - Reliability
    - Capital costs
    - Operating/maintenance costs
- Identify the **roles** of other Metropolitan Planning Organizations (MPOs) and cities in the collection and analysis of crowd-sourced or dispersed air quality data

RESEARCH QUESTIONS: HEALTH

- **What data sources** are available to synthesize with air quality data to try to isolate the role that individual (e.g., age, income, race/ethnicity, smoking status, diet, physical activity, health status) factors may play in confounding or modifying the health effects of traffic-related air pollution?
- Can these **individual level factors** be used to create socio-economic profiles and indicators of health risk due to traffic-related air pollution?
- Which **transportation, built environment and demographic** variables impact respiratory health?
  - How large is the magnitude of this impact?
- Do these variables describe particular types of **locations** in metropolitan areas appear more susceptible to respiratory diseases?

METHODOLOGY

Data Source

- Temporal and spatial aggregation characteristics of the data sources
- Cross-sectional or longitudinal

Health Outcomes

- Dallas-Fort Worth Federal Statistical Research Data Center access to restricted variables (geocodes) of 2017/2018) National Health Interview Survey (NHIS)
- Health outcomes of interest relate include: asthma, lung cancer, cardio-vascular disease, Type II diabetes, and low birth-weight

Modeling

- Use air quality, transportation, and other confounding effects
- Two approaches
  - Disaggregate logistic regression model
  - Treed regression models, which are combinations of Classification and Regression Tree (CART) models and stepwise logistic regression models to assess adverse health effects of exposure.

Analyze

- Implementation issues and recommend strategies for future data collection and analysis

LITERATURE REVIEW-INDICATORS

Transportation Indicators Contributing to Health Outcomes

1. Access to Health-Related Goods and Services (Litman, 2013)	17. Housing affordability in accessible locations (Litman, 2007)	33. Quality of transport fo disadvantaged people (Litmai 2007)
2. Activities (Marquez and Smith, 1999)	18. Infectious diseases (Corti et al., 2016)	34. Residential Density (Badoe an Miller, 2000)
3. Auto Ownership (Badoe and Miller, 2000)	19. Land use mix (Ewing et al., 2002 and Stone, 2008)	35. Respiratory disease (Corti et al 2016)
4. Birth defects (Samaranayake et al., 2014)	20. Link Loads (Geurs and Wee, 2004)	36. Road Network (Badoe an Miller, 2000)
5. Body mass index (Frank et al., 2007)	21. Rout Choice (Geurs and Wee, 2004)	37. Sprawl index (Stone, 2008)
6. Cancer (Corti et al., 2016)	22. Location and characteristics of infrastructure (Geurs and Wee, 2004)	38. Street Connectivity (Ewing al., 2002)
7. Cardiovascular disease (Corti et al., 2016)	23. Low-birth weight (Samaranayake et al., 2014)	39. Traffic Assignment (Armstron and Khan, 2004)
8. Respiratory diseases e.g. lung cancer and asthma (Samaranayake et al., 2014)	24. Mean daily grams of NOx, CO, PM2.5, PM10 (EPA)	40. Traffic Crashes (Litman, 2013
9. Connectivity (Ewing et al., 2002 and Stone, 2008)	25. Mean daily VMT per person (Litman, 2007)	41. Transit affordability (Litmai 2007)
10. Demand management (Corti et al., 2016)	26. Minutes of active transportation last week (Frank et al, 2007)	42. Transit Service (Badoe an Miller, 2000)
11. 5Ds (Corti et al., 2016)	27. Modal Split (Armstrong and Khan, 2004)	43. Travel speed (Geurs and We 2004)
12. Demographic and other covariates Miles to nearest bus stop (Frank, 2006)	28. Mode Choice, Destination Choice (Geurs and Wee, 2004)	44. Travel Times/ Distances/cos (Geurs and Wee, 2004)
13. Destination accessibility (Corti et al., 2016)	29. Neighborhood Design (Badoe and Miller, 2000)	45. Trip Distribution (Armstron and Khan, 2004)
14. Distribution of employment (Corti et al., 2016)	30. Net residential density (Frank et al., 2007)	46. Vehicle hours lost in congestio (Geurs and Wee, 2004)
15. Employment Density (Badoe and Miller, 2000)	31. Physical Activity and Fitness (Litman, 2013)	47. Vehicle Pollution Exposu (Litman, 2013)
16. Food and health, service access (Corti et al., 2016)	32. Population (Marquez and Smith, 1999)	48. Walkability Index (Litmai 2007)

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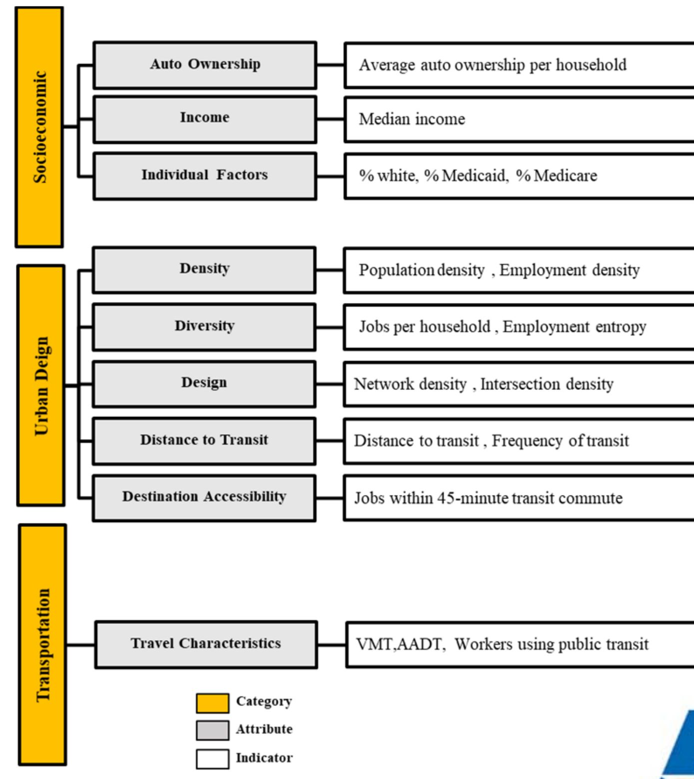
LITERATURE REVIEW

5Ds

Density	*Density* is always measured as the variable of interest per unit of area. The area can be gross or net, and the variable of interest can be population, dwelling units, employment, building floor area, or something else.
Diversity	*Diversity* measures pertain to the number of different lands uses in each area and the degree to which they are represented in land area, floor area, or employment.
Design	*Design* includes street network characteristics within an area. Measures include average block size, proportion of four-way intersections, and number of intersections per square mile.
Destination Accessibility	*Destination accessibility* measures ease of access to trip attractions. It may be regional or local. Regional accessibility is either distance to the central business district or the number of jobs or other attractions reachable within a given travel time, which tends to be highest at central locations and lowest at peripheral ones.
Distance	*Distance to transit* is usually measured as an average of the shortest street routes from the residences or workplaces in an area to the nearest rail station or bus stop. Alternatively, it may be measured as transit route density, distance between transit stops, or the number of stations per unit area

DATA COLLECTION

- Reduced 48 factors to 30 variables by merging similar indicators into one factor.
- Factors categorized into 3 categories using a hierarchy of categories, attributes and indicators
  - Socioeconomic
  - Urban design
  - Transportation



Hierarchy of Variables

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PRELIMINARY STUDY

PRELIMINARY DATA COLLECTION-HEALTH RISK

Respiratory hazard quotient (RHQ) – dependent variable

- Developed by EPA as part of the 2011 National Air Toxics Assessment (NATA)
- Defined as ratio of the potential exposure to a substance and the level at which no adverse effects are expected (calculated as the exposure divided by the appropriate chronic or acute value)
- RHQ of 0 means adverse health effects (respiratory disease) appear unlikely and pose no risk
- RHQs greater than 0 and closer to 1, indicate increased potential for adverse effects

DATA COLLECTION

Study Sites

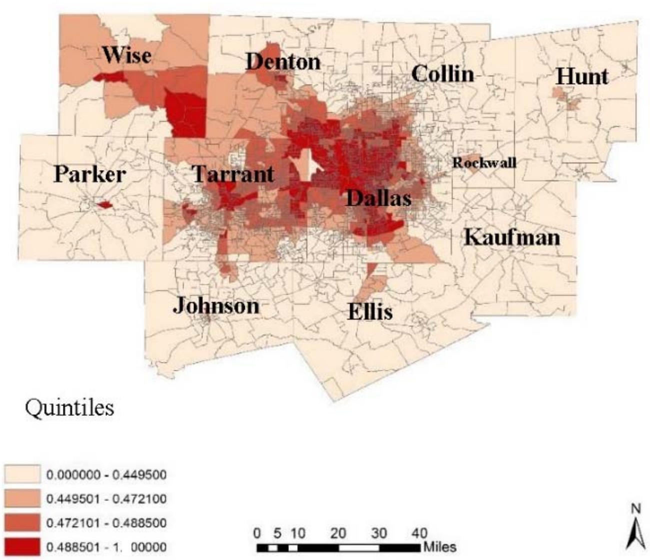
The study areas have a population of more than 1 million and different sizes of transit systems. The demographics in both sites have some similarities with large Hispanic populations and similar age profiles. Both have similar road networks but different built environments.

Dallas- Fort Worth (TX)

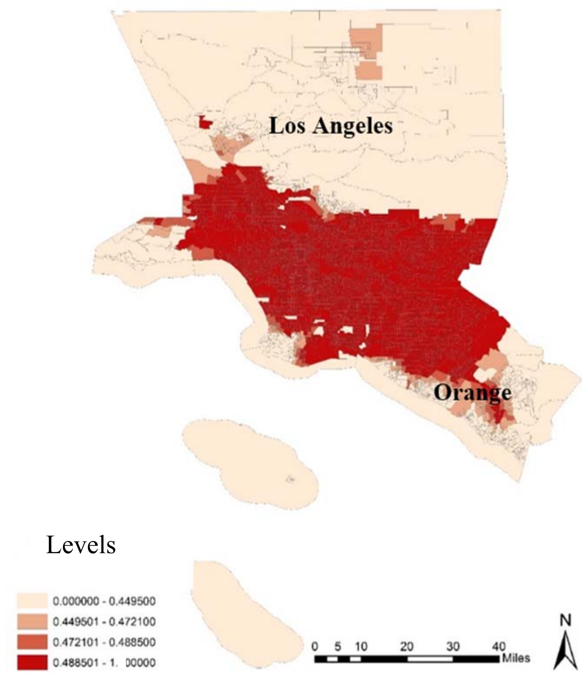
Los Angeles (CA)

SPATIAL DISTRIBUTION OF HEALTH RISK

Dallas- Fort Worth (TX)



Los Angeles (CA)



DESCRIPTIVE STATISTICS-LA

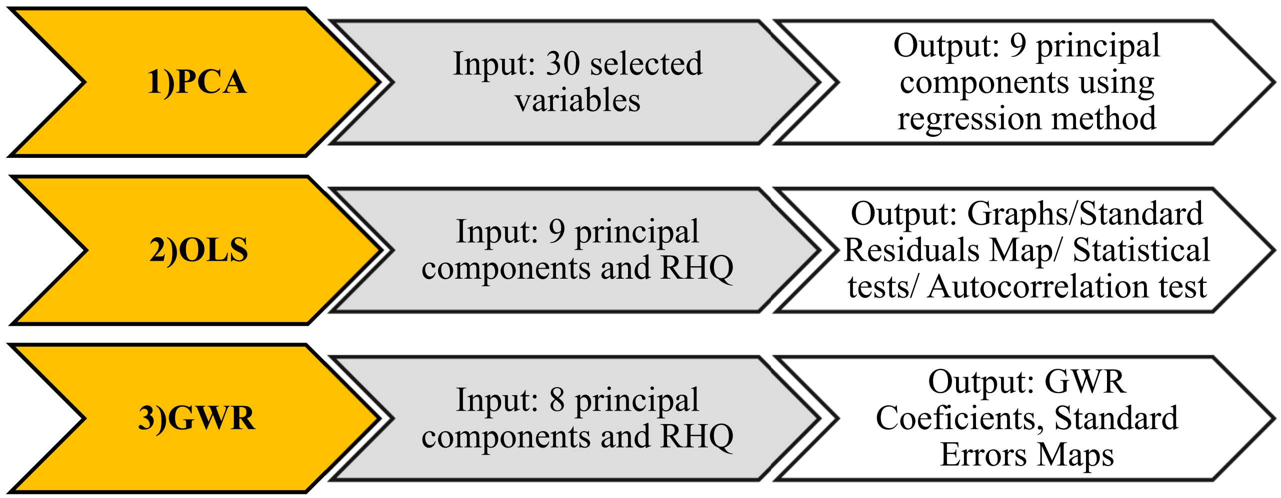
	Variables	Mean	SD	Min	Max
Urban Design	EIR1-Gross population density (people/acre)	20.21	16.41	0.00	300.03
	EIR2-Gross employment density (jobs/acre)	5.22	14.17	0.00	611.21
	EIR3-Jobs per household	17.58	491.26	0.00	32725.00
	EIR4-Employment and household entropy*	0.48	0.21	0.00	0.99
	EIR5-Total road network density	21.39	7.22	0.00	68.63
	EIR6-Intersection density per square mile	2.12	5.66	0.00	83.02
	EIR7-Distance from jobs to transit stop (meters)	0.79	0.40	0.00	1.00
	EIR8-Frequency of transit within 0.25 miles	71.45	140.12	0.00	4400.67
	EIR9-Aggregate frequency of transit per square mile	831.74	3042.66	0.00	209112.32
	EIR10-Jobs within 45 minutes auto travel time	472171.43	157447.44	0.00	916589.45
	EIR11-Working age population -45 min travel time	790607.33	254666.40	0.00	1598202.65
	EIR12-Jobs within 45-minute transit commute	15000.17	16735.94	0.00	159226.14
	EIR13-Population within 45-min transit commute	12281.94	11487.56	0.00	129098.16
Socioeconomics	EIR14-White population (%)	32.06	27.75	0.00	100.00
	EIR15-Hispanic population (%)	43.15	30.14	0.00	100.00
	EIR16-Population under 18 years old (%)	21.65	8.39	0.00	58.97
	EIR17-Population 18-64 years old (%)	64.27	9.82	0.00	100.00
	EIR18-Population over 65 years old (%)	13.69	9.05	0.00	100.00
	EIR19-Average vehicle ownership	1.89	0.49	0.00	3.41
	EIR20-Medicare Coverage Population (%)	9.20	7.33	0.00	100.00
	EIR21-Medicaid population (%)	18.40	15.16	0.00	83.15
	EIR22-Medicare and Medicaid Population (%)	3.33	3.54	0.00	62.61
	EIR23-No insurance coverage Population (%)	12.01	8.94	0.00	68.41
	EIR24-Average median income	71835.39	39064.52	0.00	249034.0
Transporta tion	EIR25-Average Annual Daily Traffic	943209.83	1453415.97	0.00	26957175.0
	EIR26-Workers using their own vehicle (%)	74.67	13.33	0.00	100.00
	EIR27-Workers using carpooling (%)	9.53	7.01	0.00	56.38
	EIR28-Workers using public transit (%)	5.18	7.36	0.00	80.40
	EIR29-Workers using bike or walking (%)	3.29	5.83	0.00	100.00

MODELING PROCEDURE

Factor (Variable) Selection

Base Model

Advanced Model



Modeling Procedure

PCA-LA

Variance and Loadings explained by components obtained from PCA-LA

Component	Factor	loadings	Initial Eigenvalues	Rotation Sums of Squared Loadings
1: Demographic characteristics	EIR-21	0.85	27.07 (27.07 % Cumulative Variance)	15.9 (15.9 % Cumulative Variance)
	EIR-15	0.82		
	EIR-14	-0.80		
	EIR-24	-0.69		
	EIR-23	0.64		
	EIR-16	0.63		
2: Transit access to jobs	EIR-9	0.78	11.44 (38.51 % Cumulative Variance)	11.7 (27.6 % Cumulative Variance)
	EIR-8	0.75		
	EIR-12	0.72		
	EIR-28	0.63		
	EIR-1	0.46		
3: Workplace accessibility	EIR-10	0.84	6.44 (44.95 % Cumulative Variance)	11.0 (38.6 % Cumulative Variance)
	EIR-11	0.83		
	EIR-7	0.66		
	EIR-13	0.60		
4: Older adults	EIR-18	-0.85	6.15 (51.11 % Cumulative Variance)	7.5 (46.1 % Cumulative Variance)
	EIR-17	0.75		
	EIR-20	-0.72		
	EIR-22	-0.41		
5: Automobile access	EIR-29	0.68	5.90 (57.01 % Cumulative Variance)	7.4 (53.5 % Cumulative Variance)
	EIR-19	-0.61		
	EIR-26	-0.59		
6: Employment Density	EIR-4	0.80	4.31 (61.33 % Cumulative Variance)	5.5 (59.0 % Cumulative Variance)
	EIR-2	0.53		
7: Miles Driven	EIR-6	0.88	4.10 (65.42 % Cumulative Variance)	5.5 (64.5 % Cumulative Variance)
	EIR-25	0.64		
	EIR-5	0.56		
8: Jobs per household	EIR-3	-0.86	3.78 (69.20 % Cumulative Variance)	4.2 (68.7 % Cumulative Variance)
9: Carpooling	EIR-27	0.84	3.50 (72.71 % Cumulative Variance)	4.0 (72.7 % Cumulative Variance)

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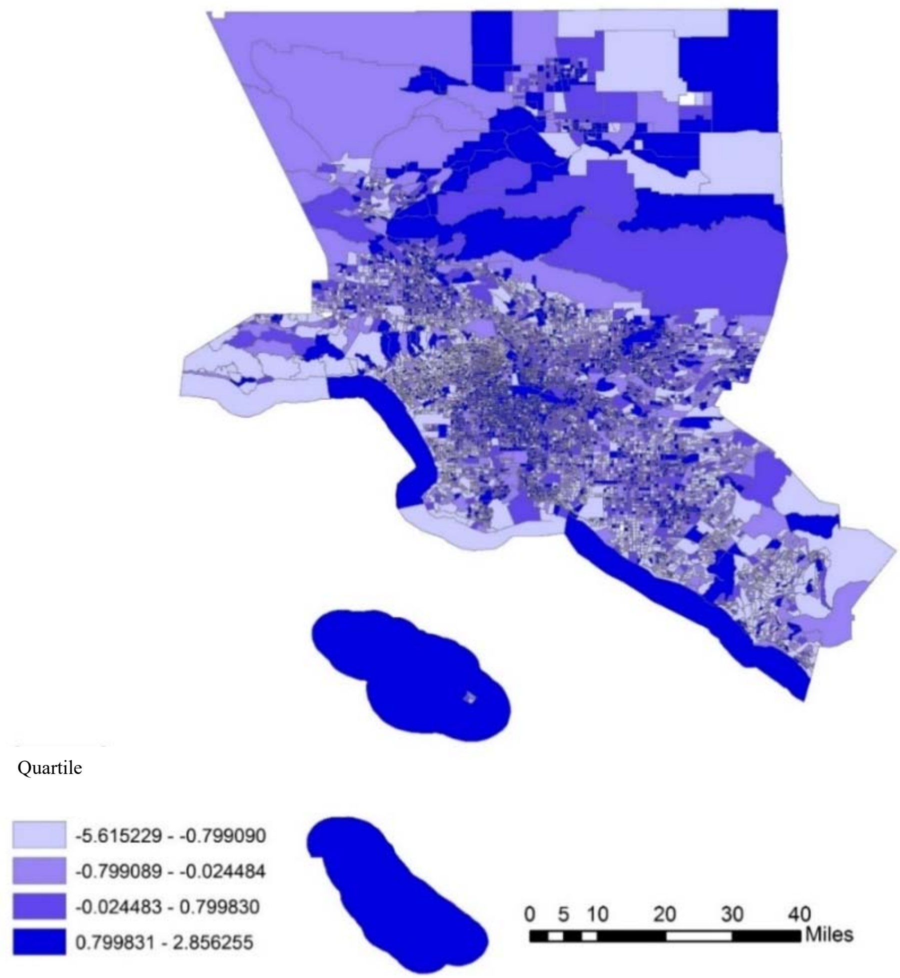
RESULTS - DEMOGRAPHIC

Spatial distribution of the Demographic characteristics in the Los Angeles MSA



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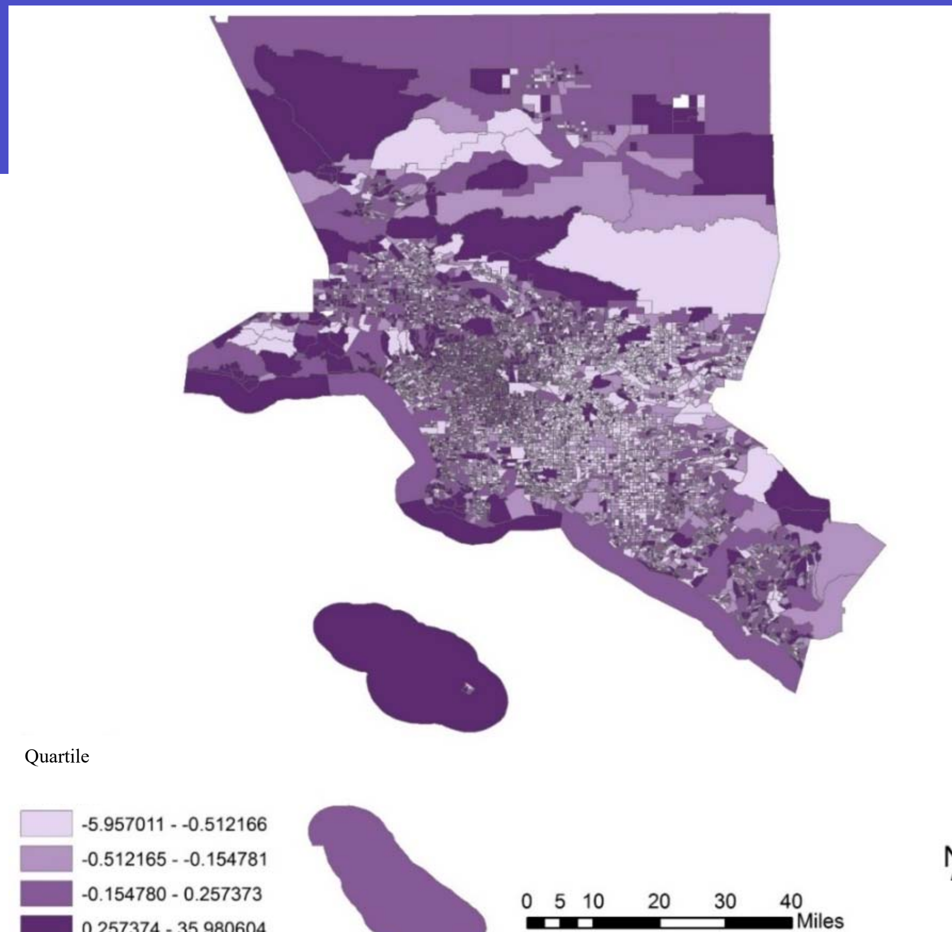
RESULTS – TRANSIT ACCESS

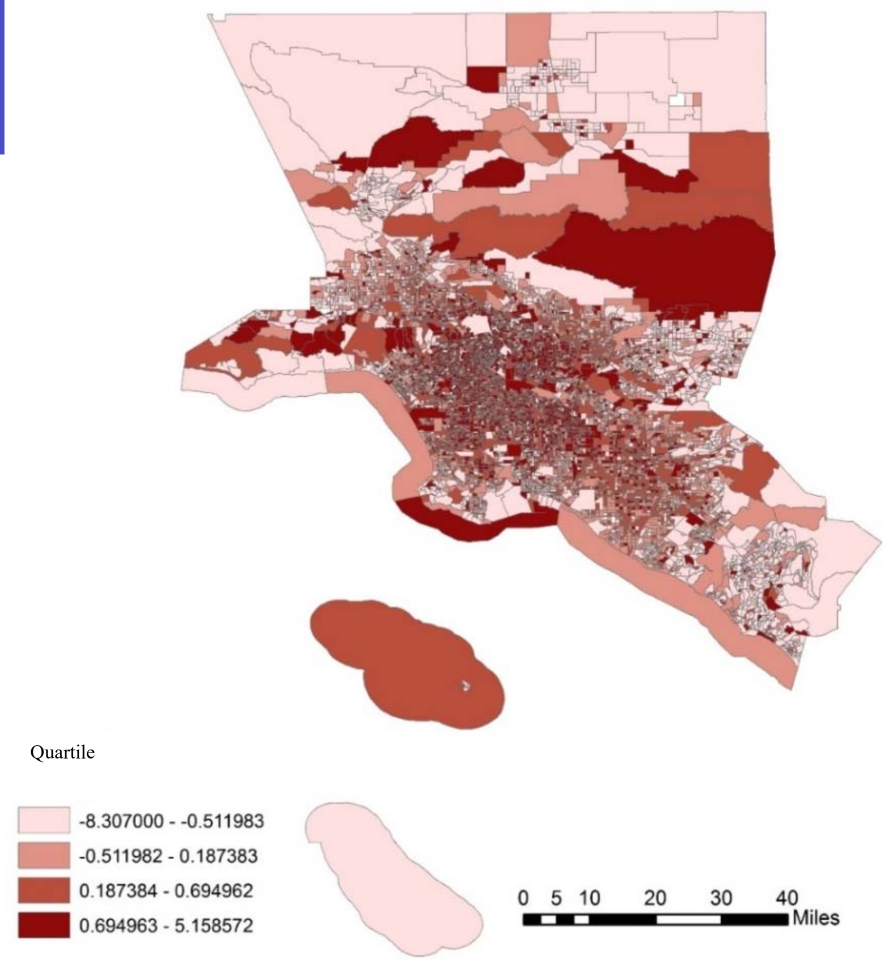
Transit access to jobs



Spatial distribution of transit access to jobs in the Los Angeles MSA

RESULTS – ACCESSIBILITY

Spatial distribution of workplace accessibility in the Los Angeles MSA



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RESULT – BASE MODEL (OLS REGRESSION)

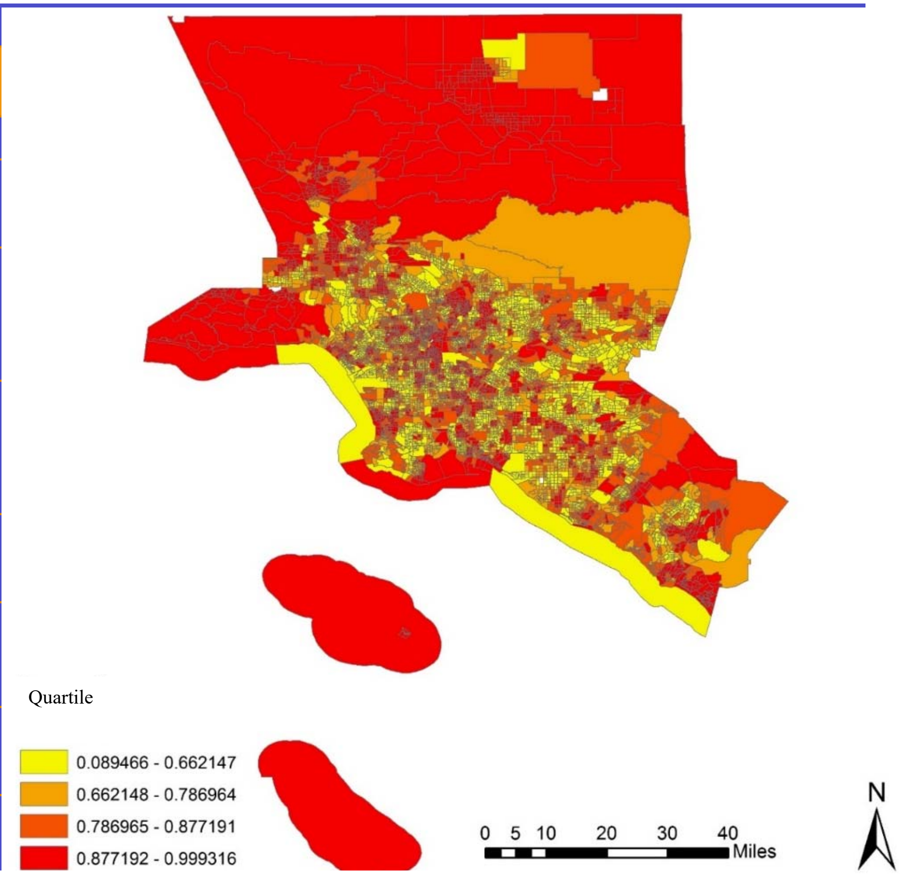
	OLS model			Moran's I test	
Variable	Coefficient	Standard Error	t-Statistic	Moran's I Index	z-Score
1: Demographics	0.0217 *	0.0006	31.7526	0.0699*	230.1568
2: Transit access to jobs	0.0246*	0.0006	36.0319	0.1157 *	385.3916
3: Workplace accessibility	0.0608*	0.0006	88.9070	0.1252*	411.6870
4: Older adults	0.0036*	0.0006	5.2767	0.0062*	20.9759
5: Automobile access	0.0068*	0.0006	10.0518	0.0340*	112.1484
6: Employment Density	0.0011	0.0006	1.7001	NA[1]	NA[1]
7: Miles Driven	0.0072*	0.0006	10.5645	0.0082 *	27.4375
8: Jobs per household	0.0096*	0.0006	14.1234	0.0044*	16.0915
9: Carpooling	0.0019*	0.0006	2.7985	0.0125*	41.5259

***Indicates a statistically significant p-value at .05 level.**
R^2 = 0.48; adjusted R^2 =0.56; Akaike information criterion = -22389.03;
Koenker (BP) statistic = 1075.005 (p-value = .0000*).

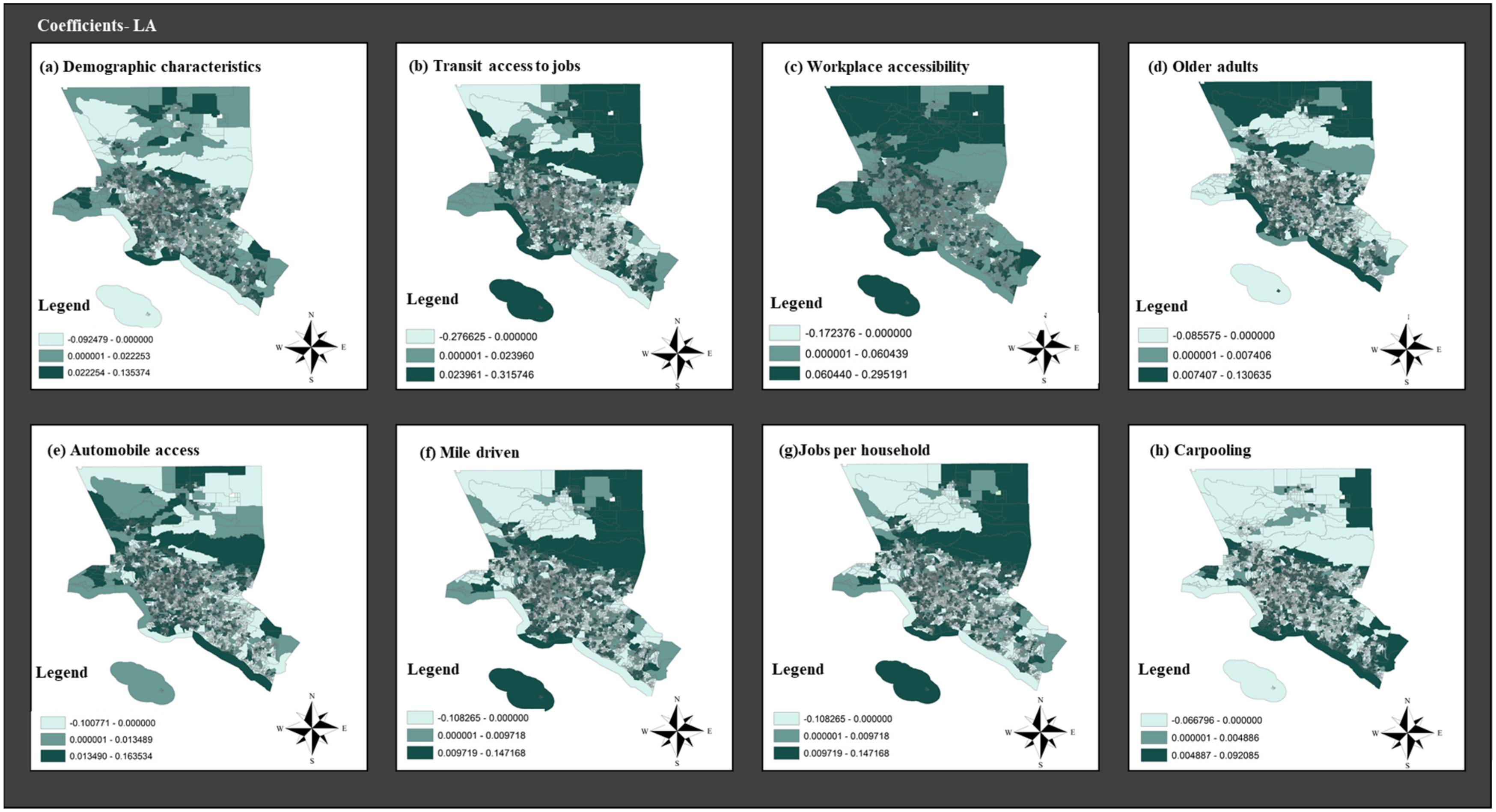
Estimated GWR coefficients-LA

Variable	Median	Max.	Min	SD
Constant	0.5881	0.8292	0.3843	0.0456
Component 1 Demographics	0.0143	0.1536	-0.1140	0.0232
Component 2 Transit Access to Jobs	0.0276	0.4114	-0.3730	0.0520
Component 3 Workplace Accessibility	0.0181	0.3194	-0.1947	0.038028
Component 4 Older Adults	0.0142	0.1576	-0.1064	0.0196
Component 5 Automobile Access	0.0168	0.1934	-0.1954	0.0244
Component 7 Miles Driven	0.0137	0.2285	-0.1324	0.0234
Component 8 Jobs Per Household	0.0356	0.3229	-0.3459	0.0506
Component 9 Carpooling	0.0120	0.1207	-0.0803	0.0160
Local R^2-Value	0.7868	0.9996	0.0796	0.1541

Diagnostic: R^2 = .97; adjusted R^2 = .85.Component 4 has been excluded.

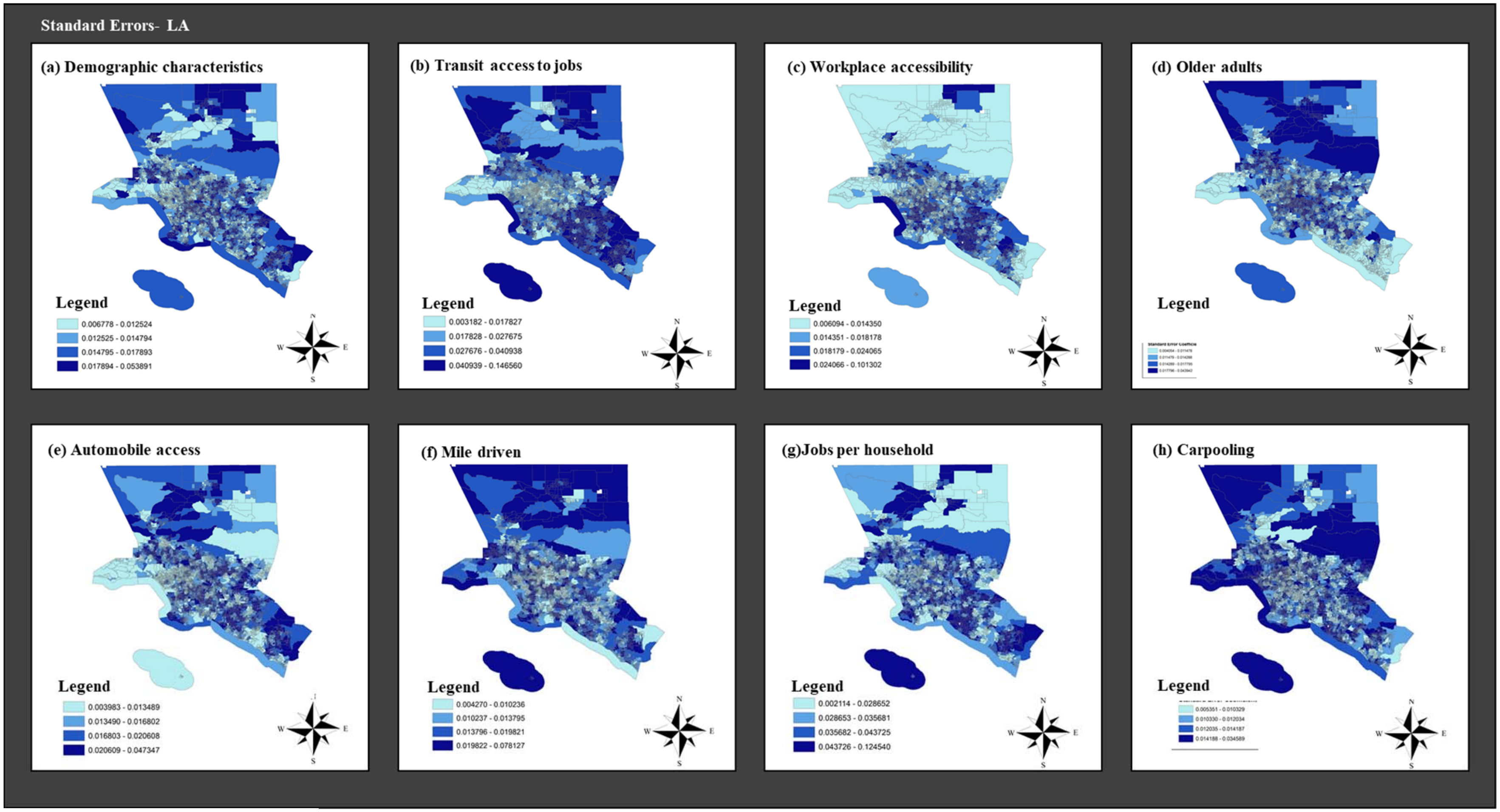


Spatial distribution of the determination coefficient, Local R^2 in the Los Angeles



Spatial distribution of estimated coefficients in the LA MSA

HK3



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Spatial distribution of Standard Errors in the LA MSA

Slide 24

HK3 I would hide this slide

Hyun, Kate, 12/15/2019

CONCLUSIONS

- The results of the feature selection (PCA) explain about 73 percent of the variation in the dependent variable in the Los Angeles MSA using nine components.
- The OLS model results indicate spatial autocorrelations appear significant.
- The GWR results show an overall positive effect of all variables
  - Los Angeles - median R^2 value of 0.79, compared to 0.48 from OLS

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CONCLUSIONS

- While demographic characteristics appear the most important determinant of aggregate respiratory disease risk, transit access to jobs represents the second most important component.
- After controlling for demographic effects, higher transit access to jobs clearly indicates a greater risk of respiratory disease, which directly confirms the research question and hypothesis.
- Those living along transit corridors and likely in transit-oriented development face a greater risk of respiratory disease.
- While other components experience greater spatial variations, the transit access to jobs displays a clear pattern and significance.

HK4
HK5

CONCLUSIONS

- Large MSAs may experience similar impacts related to
  - Transit access to jobs
  - Automobile access
  - Vehicle miles traveled
- Population living in rural areas of the metropolitan area appear more affected by transportation and land use factors.
- Demographic and socioeconomic characteristics appear to also play a significant role in risk, especially in urban and suburban BGs.
- This preliminary analysis provides a method and prioritizes the variables to consider when integrating with more localized emissions data to assess health impacts.

Slide 27

HK4 This one compares DFW and LA. Do we want to delete?
Hyun, Kate, 12/15/2019

HK5 Add one last slide to discuss how we are going to use this preliminary study to this project?
Hyun, Kate, 12/15/2019

FUTURE RESEARCH

- Further studies in other major MSAs can be useful to achieve a comprehensive and reliable model that confirms transit access to jobs as an indicator of respiratory risk in large urban areas.
- Other sizes of urban areas should be investigated
- Microlevel studies should explore impacts at the individual household level rather than block group
- Future studies should use the same methods to investigate other health outcomes negatively impacted by transportation

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FINAL WORD

The respiratory risks in high transit areas may indicate the need for new policies and building codes to provide greater protection to the residents living in those areas. This study also suggests that departments of transportation and local environmental agencies can use the results of a GWR model rather than global models to analyze the key factors and indicators (i.e. land use and transportation) that impact the risk of health issues in different locations.

UNIVERSITY OF TEXAS ARLINGTON

CIVIL ENGINEERING

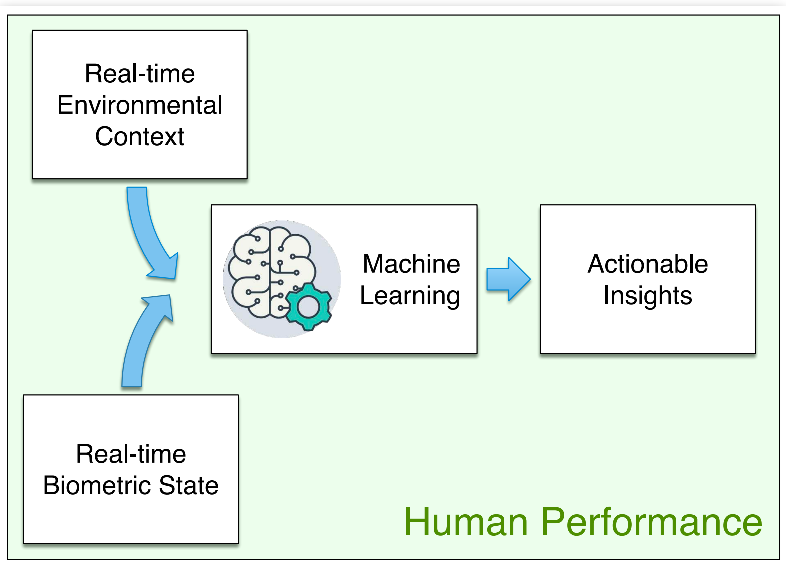
Transportation Research Center

for Livable Communities

MINTS Context Engine

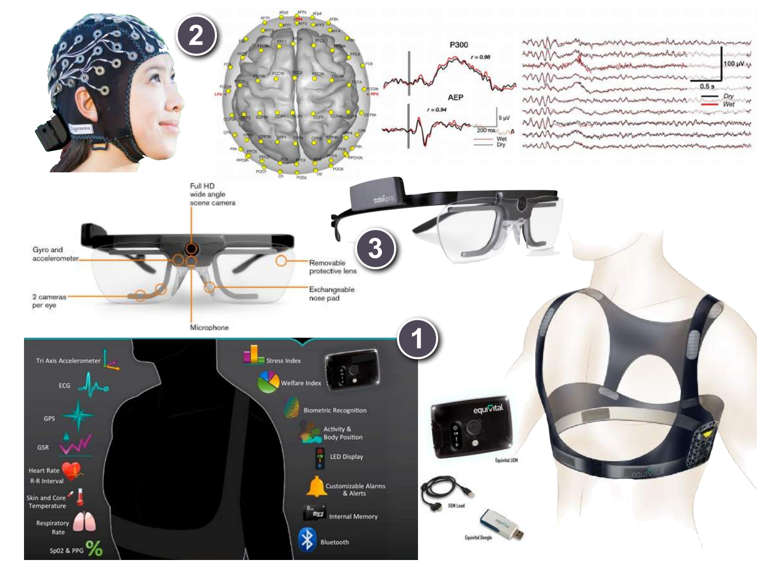
Multi-scale Integrated Interactive Intelligent Sensing and Simulation

CBRN (Chemical Biological Radiological Nuclear) Sentinels For Actionable Insights



MINTS Comprehensive Context Engine

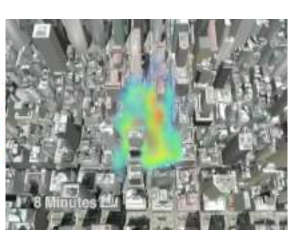
Biometrics Package



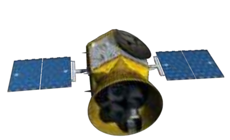
Schematic showing the holistic biometric sensing environment we propose making the human response an integral part of the sensor network. (1) Equivital Black Ghost system, (2) Cognionics 64 electrode EEG cap, and (3) Tobii Pro Glasses 2 for eye tracking.

Eight Sentinel Types

Simulation Sentinels



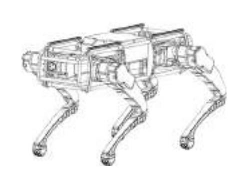
Satellite Sentinels



Aerial Survey Sentinel

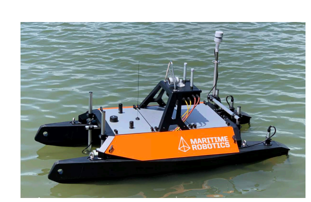
24/7 Streaming Distributed Sentinels

Walking Sentinels



Ground Survey Sentinels

Robotic Boat Sentinel



Underwater Sentinel

Dense **U**rban **E**nvironment **D**osimetry for **A**ctionable Information and **R**ecording **E**xposure (DUE DARE)

Award Number: W81XWH-18-1-0400 — Log Number: BA170483
Period of Performance: 9/30/2018-9/29/2020
Award Amount: $558,235

University of Texas at Dallas
Prof. David J. Lary

GEOLOCATED ALLERGEN SENSING PLATFORM (GASP)

NSF FUNDING IS PROVIDING A CITY WIDE QUANTITATIVE VALIDATION CAMPAIGN OF OUR SMART CITY NETWORK OF IOT LASER BASED MINIATURE POLLEN SENSORS AND FACILITATE A LARGER SCALE ROLL OUT IN THE 200 US IGNITE CITIES ACROSS AMERICA.

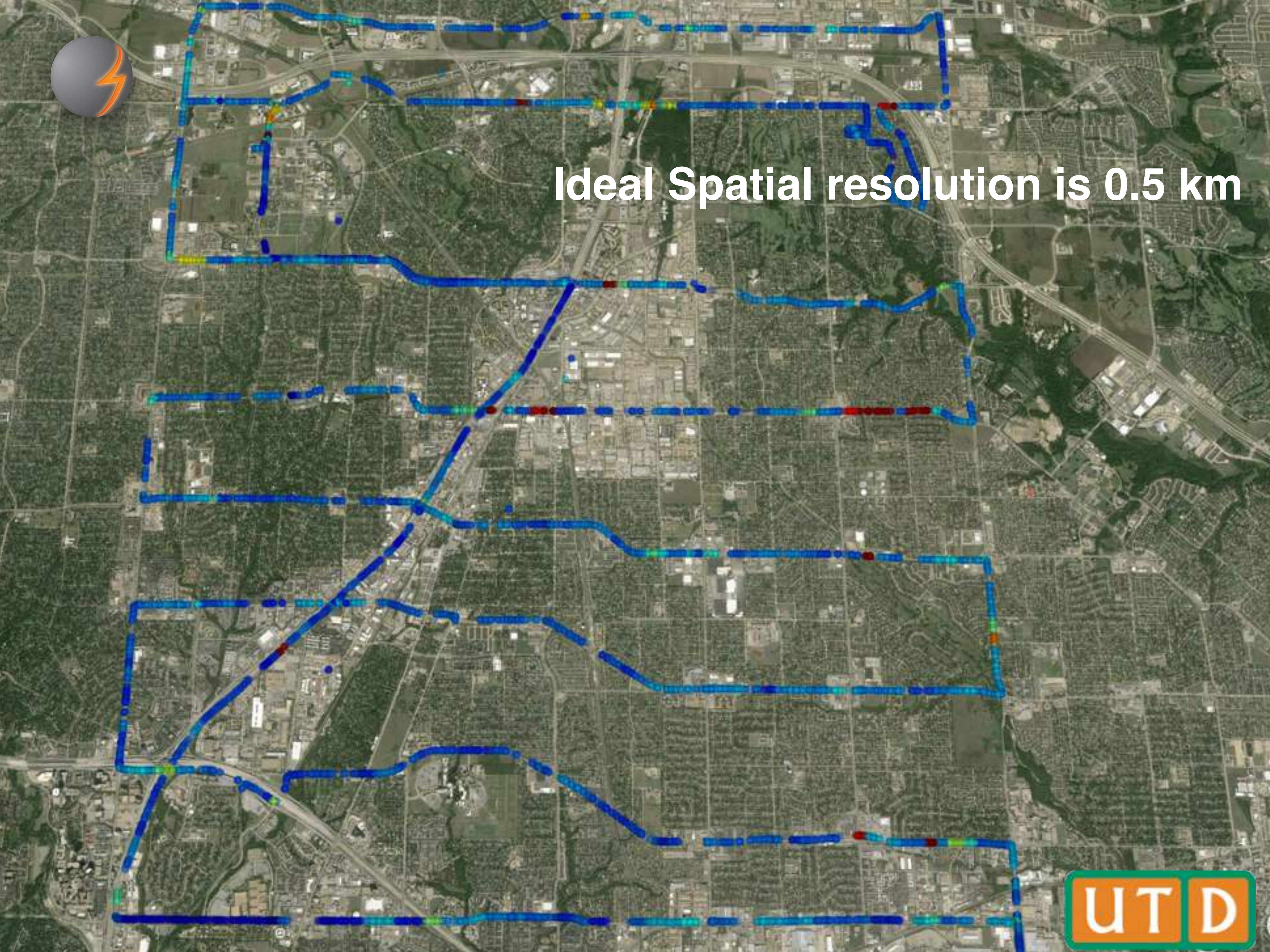
Why we care so much?

Approximately 50 million Americans have allergic diseases, including asthma and allergic rhinitis, both of which can be exacerbated by $PM_{2.5}$.

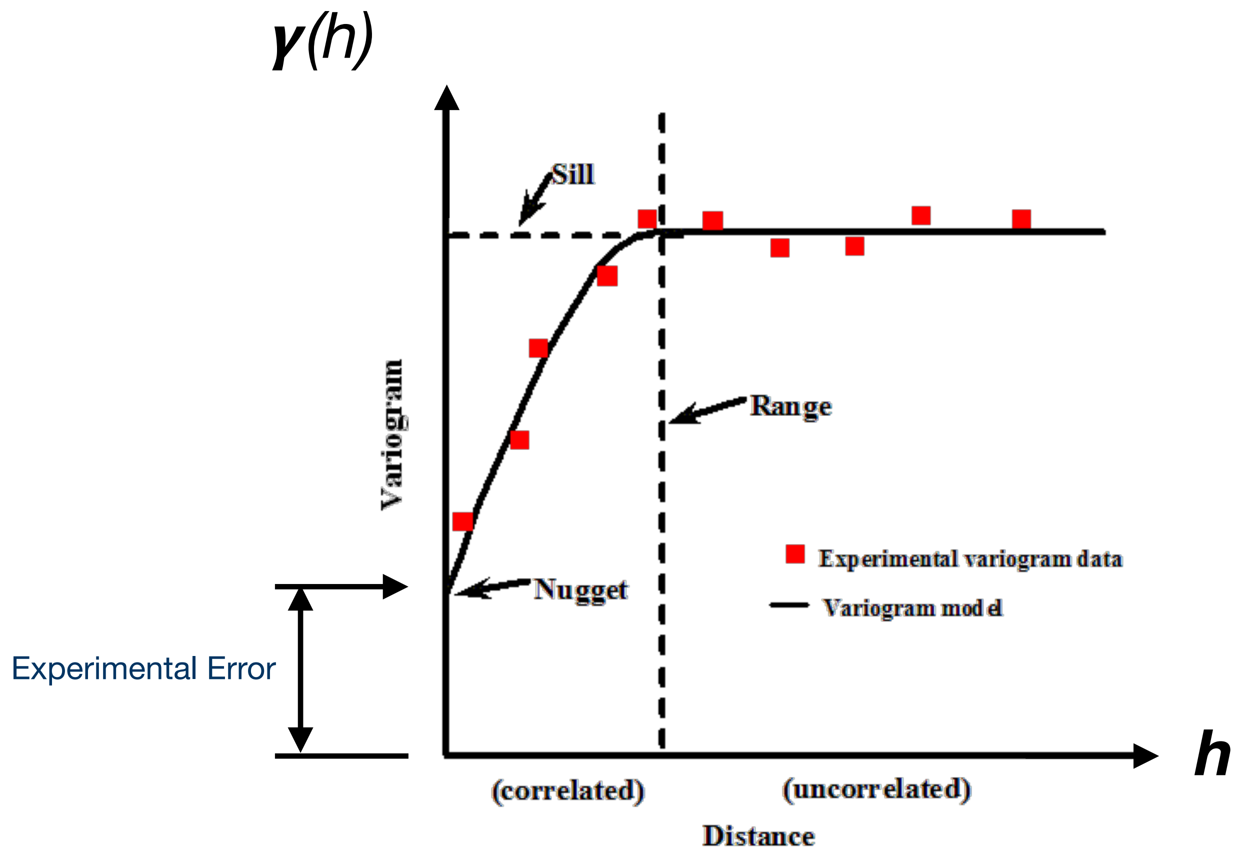
Every day in America 44,000 people have an asthma attack, and because of asthma 36,000 kids miss school, 27,000 adults miss work, 4,700 people visit the emergency room, 1,200 people are admitted to the hospital, and 9 people die.

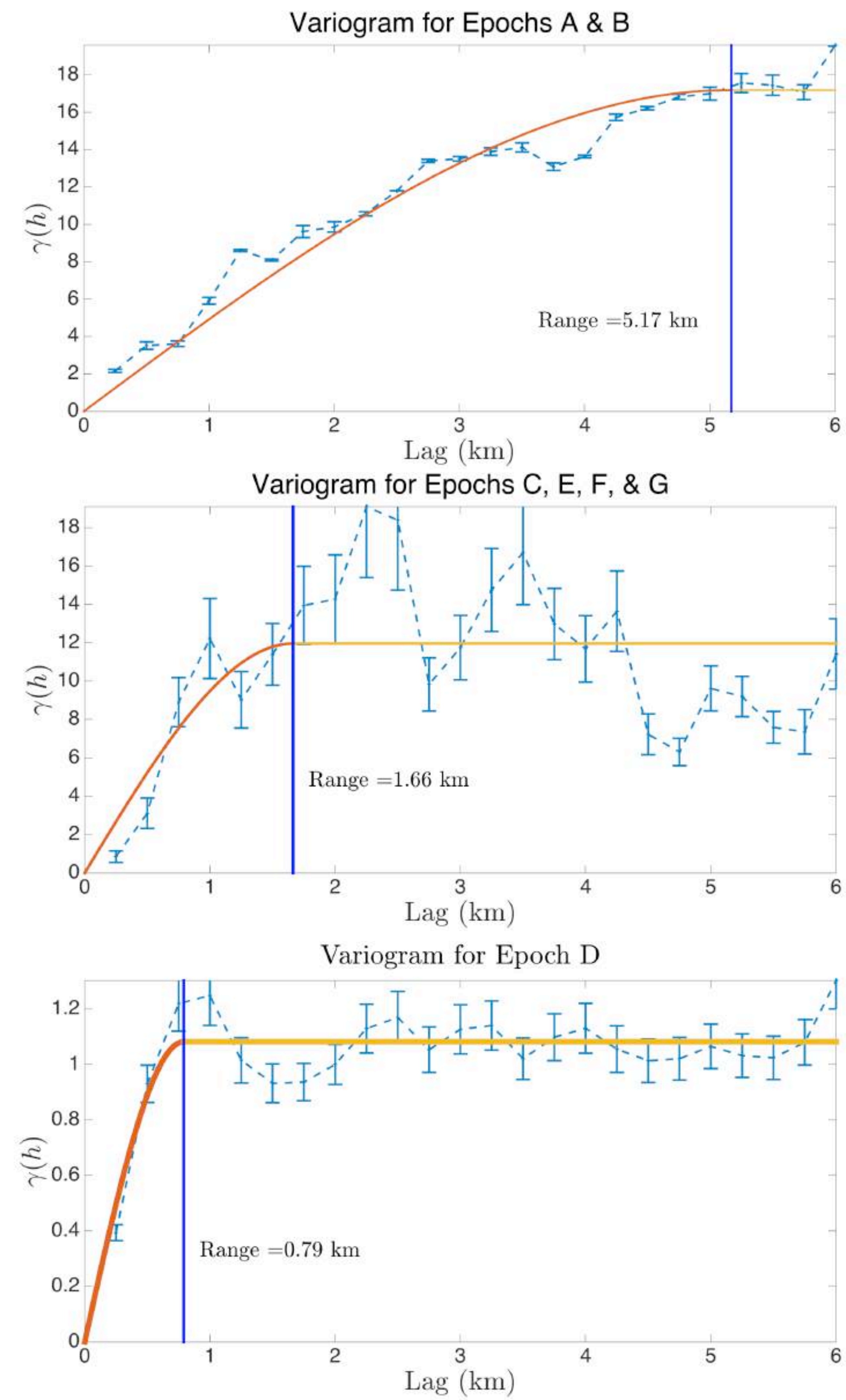
UTD

NSF


Ideal Spatial resolution is 0.5 km
UTD

What Spatial Resolution?



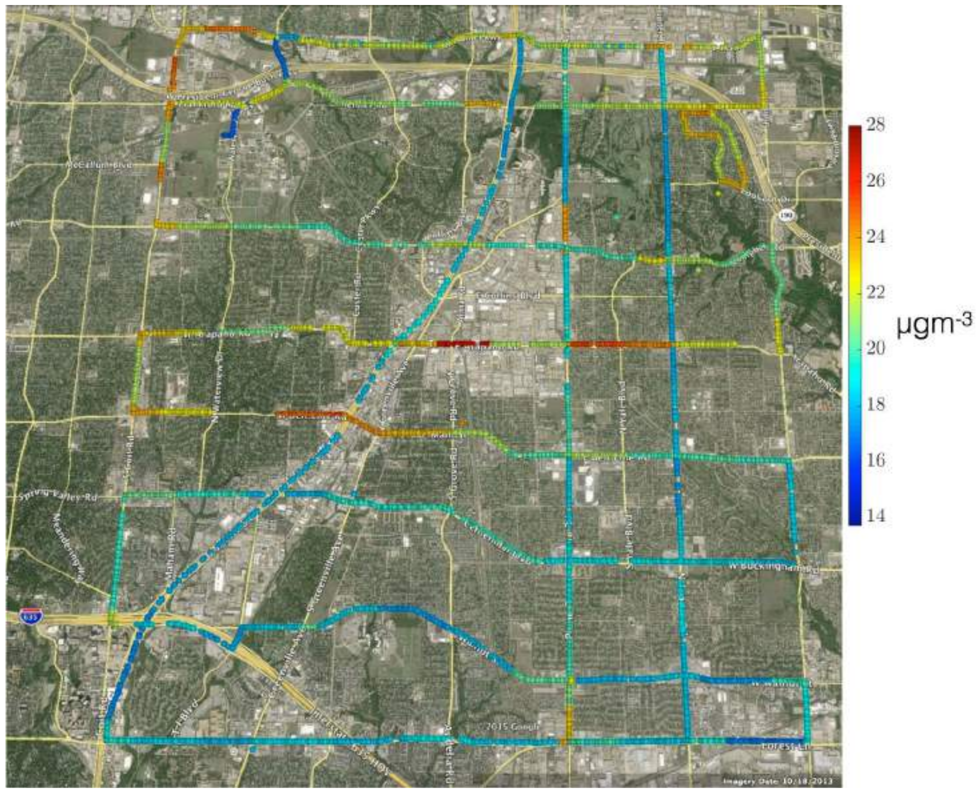


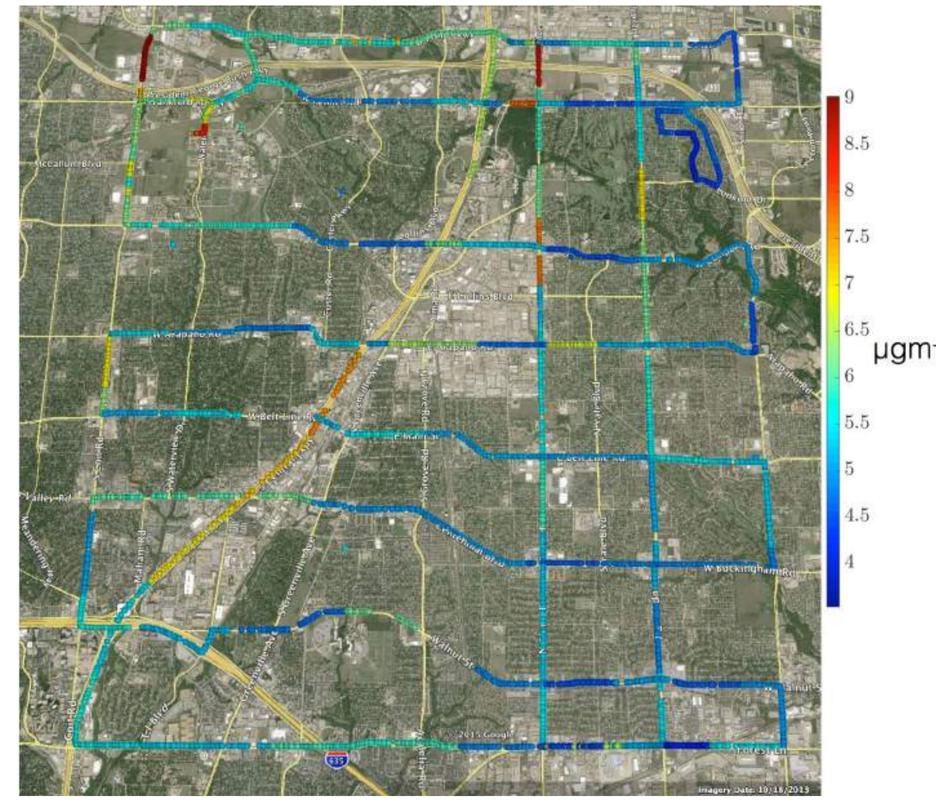
$$\gamma(h) = \frac{\sum \left(y(x_i + h) - y(x_i) \right)^2}{2N}$$

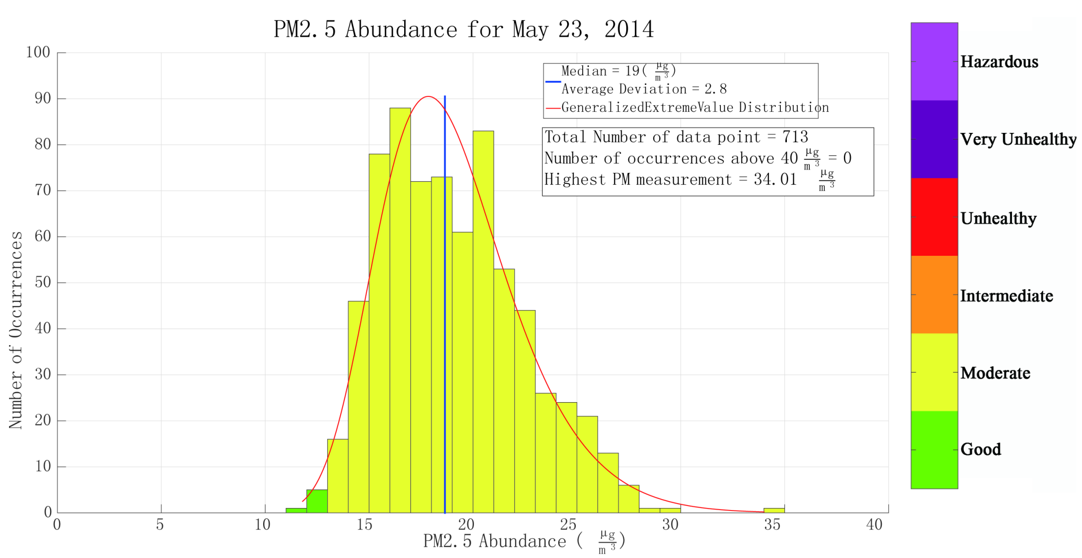
Half of the variance

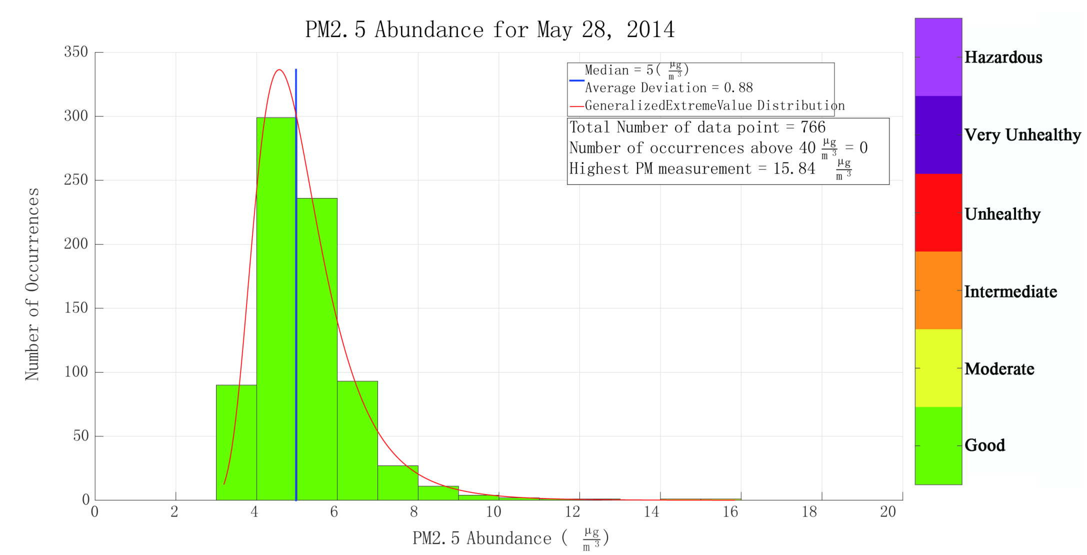
May 23, 2014

May 28, 2014









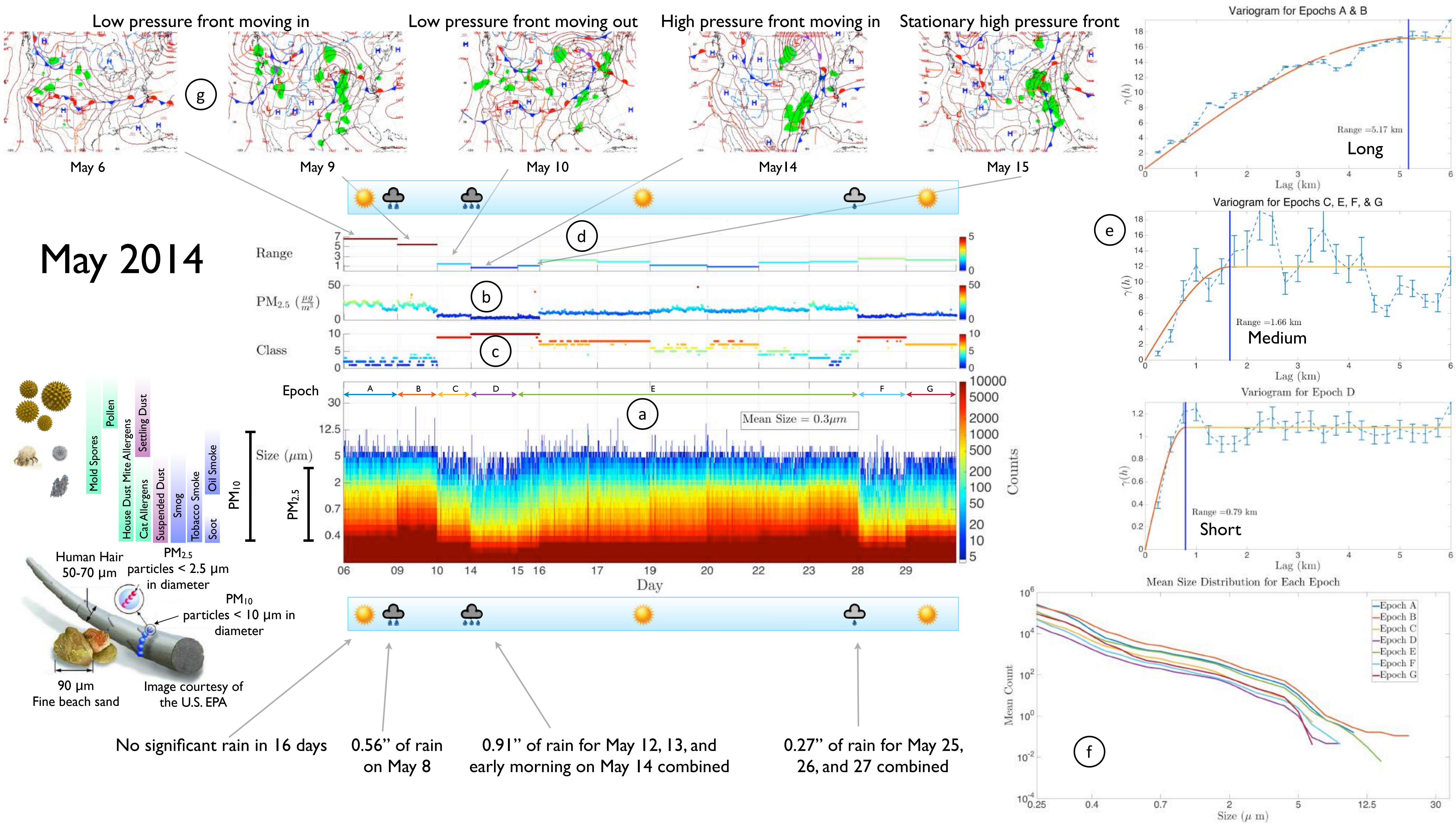
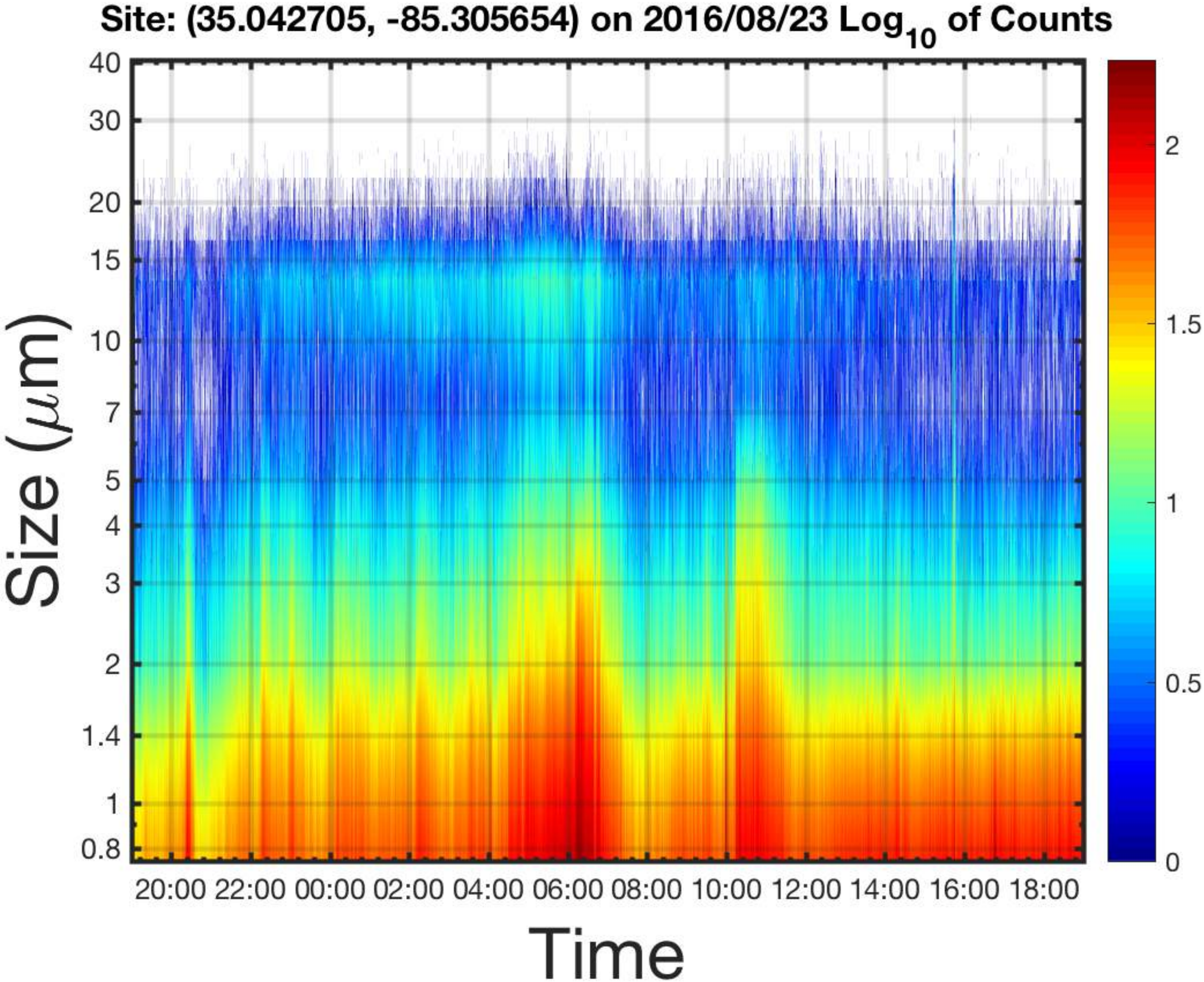


Figure 3: Overview of study with key features including size spectrum, $PM_{2.5}$ concentration, and weather summary.

A.G. Harrison, W.A., Lary, D.J., Nathan, B. and Moore, 2015/5/8, *Journal of Environmental Protection*, 6 (5), 464-476



Site: (35.042705, -85.305654) on 2016/08/23 Log10 of Counts
Size (μm)
40
30
20
15
10
7
5
4
3
2
1.4
1
0.8
20:00
22:00
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
Time
2
1.5
1
0.5
0

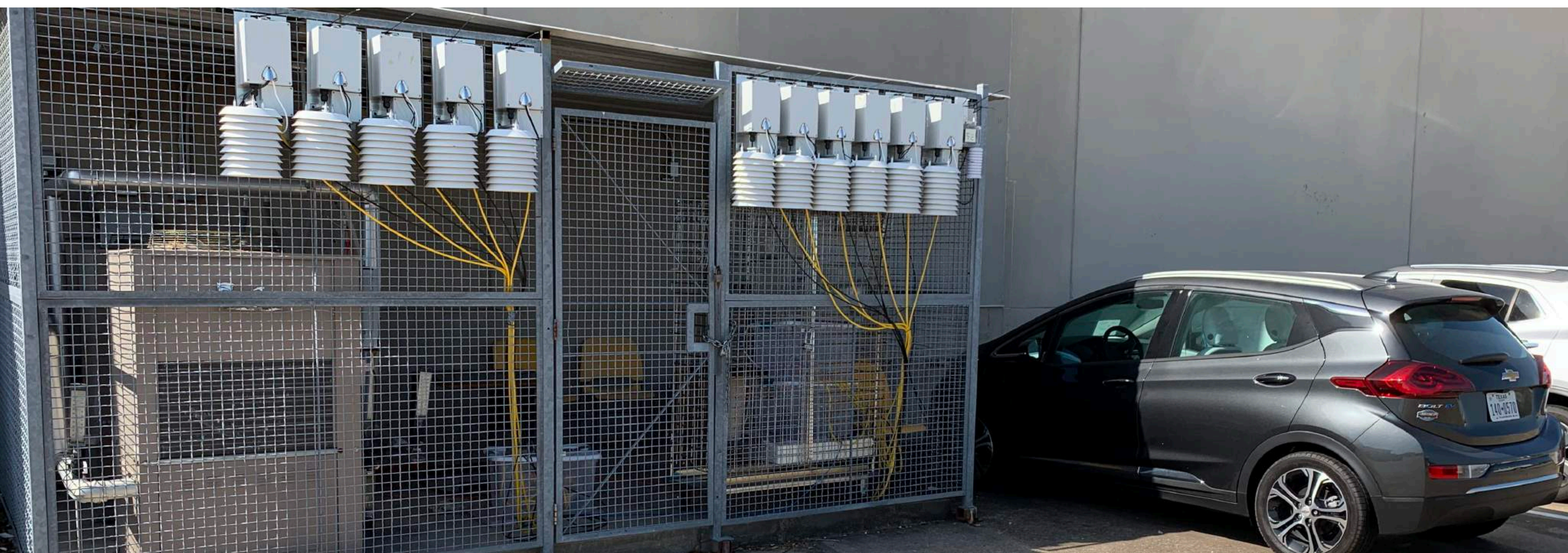
1

2

3

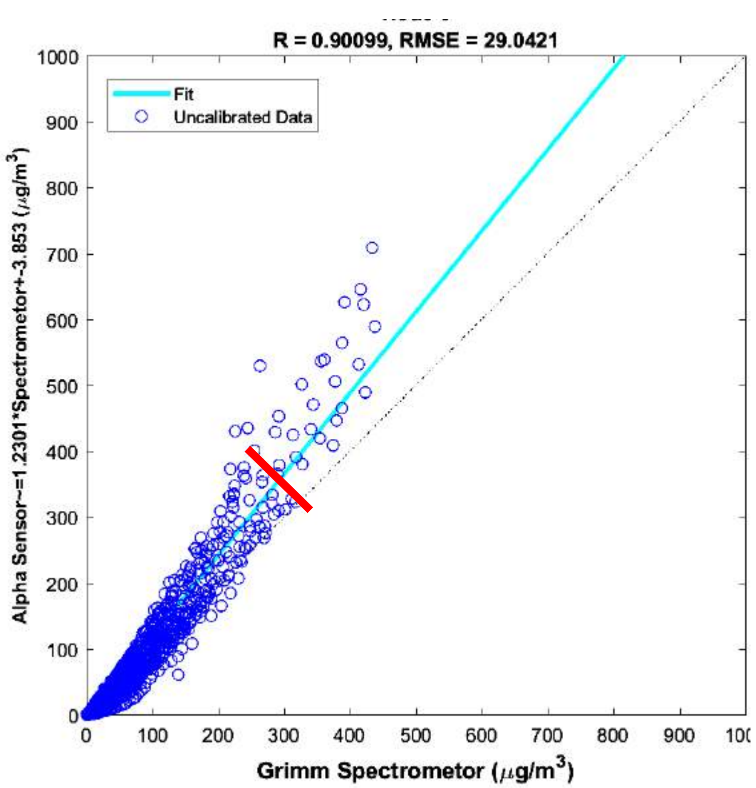
Cascade of accuracies

1. EPA certified instrument: $25,000-$50,000 (primary)
2. Medium accuracy: $2,000-$5,000 (secondary)
3. Inexpensive but useful: $200-$500 (tertiary)

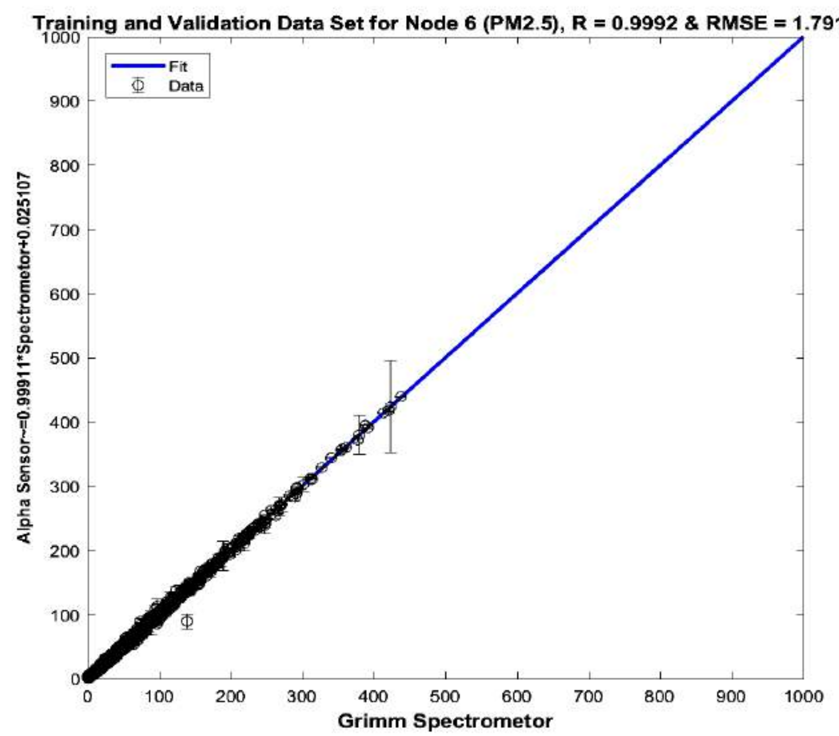


Example Machine Learning Calibration

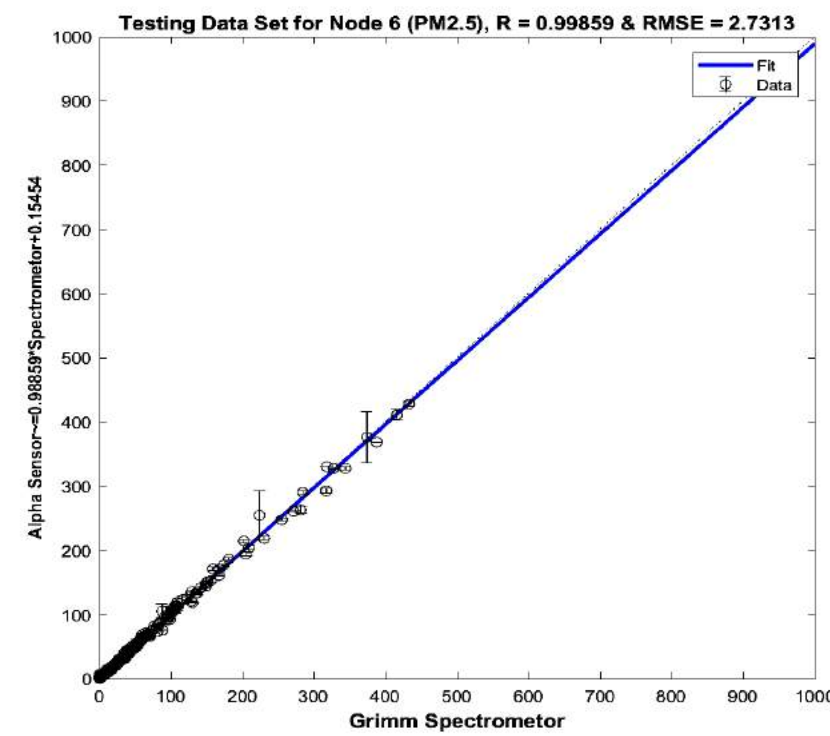
Calibration is greatly improved when it is multivariate, nonlinear and parametric.



Uncalibrated Data Set



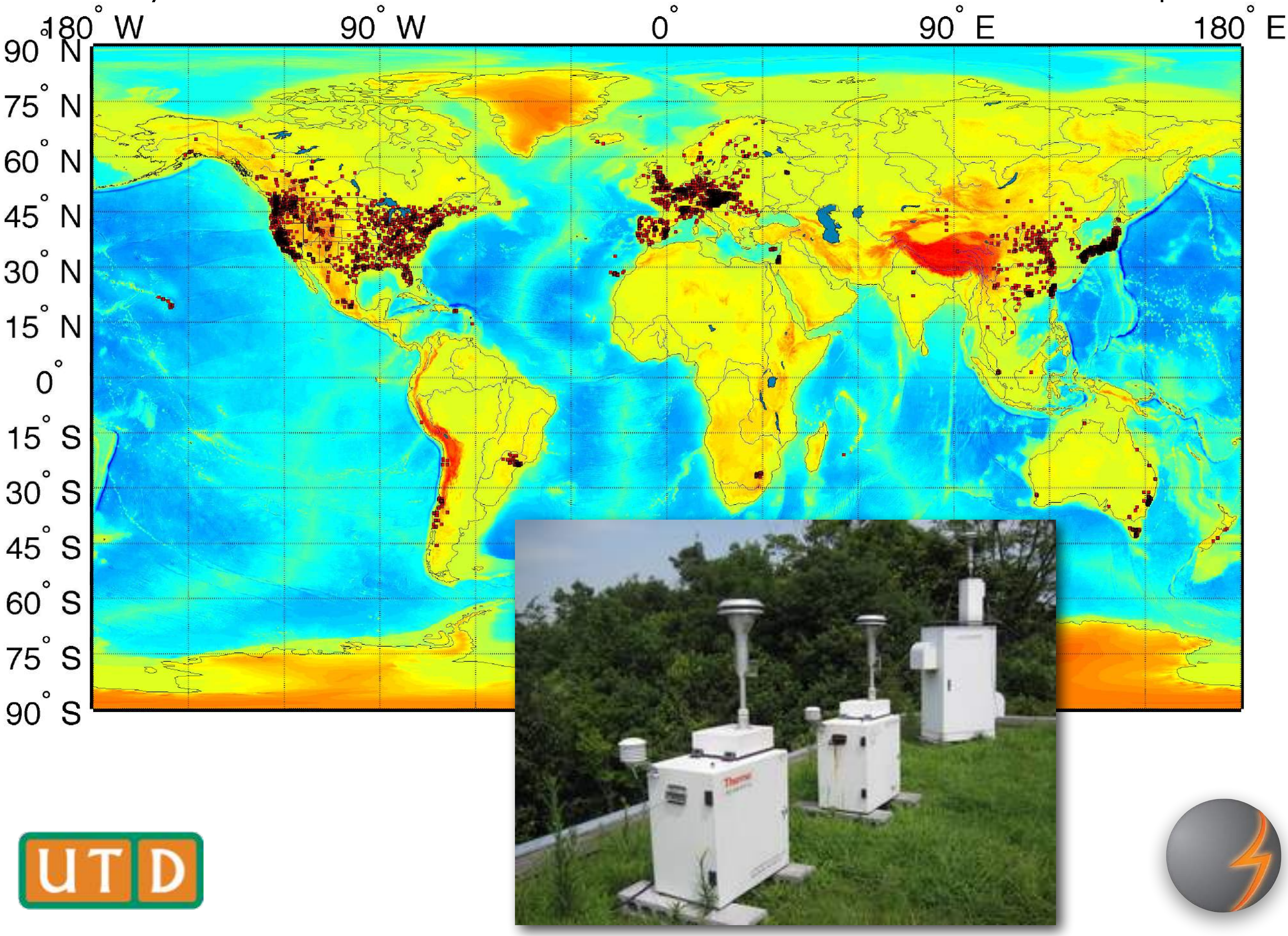
Training Data Set



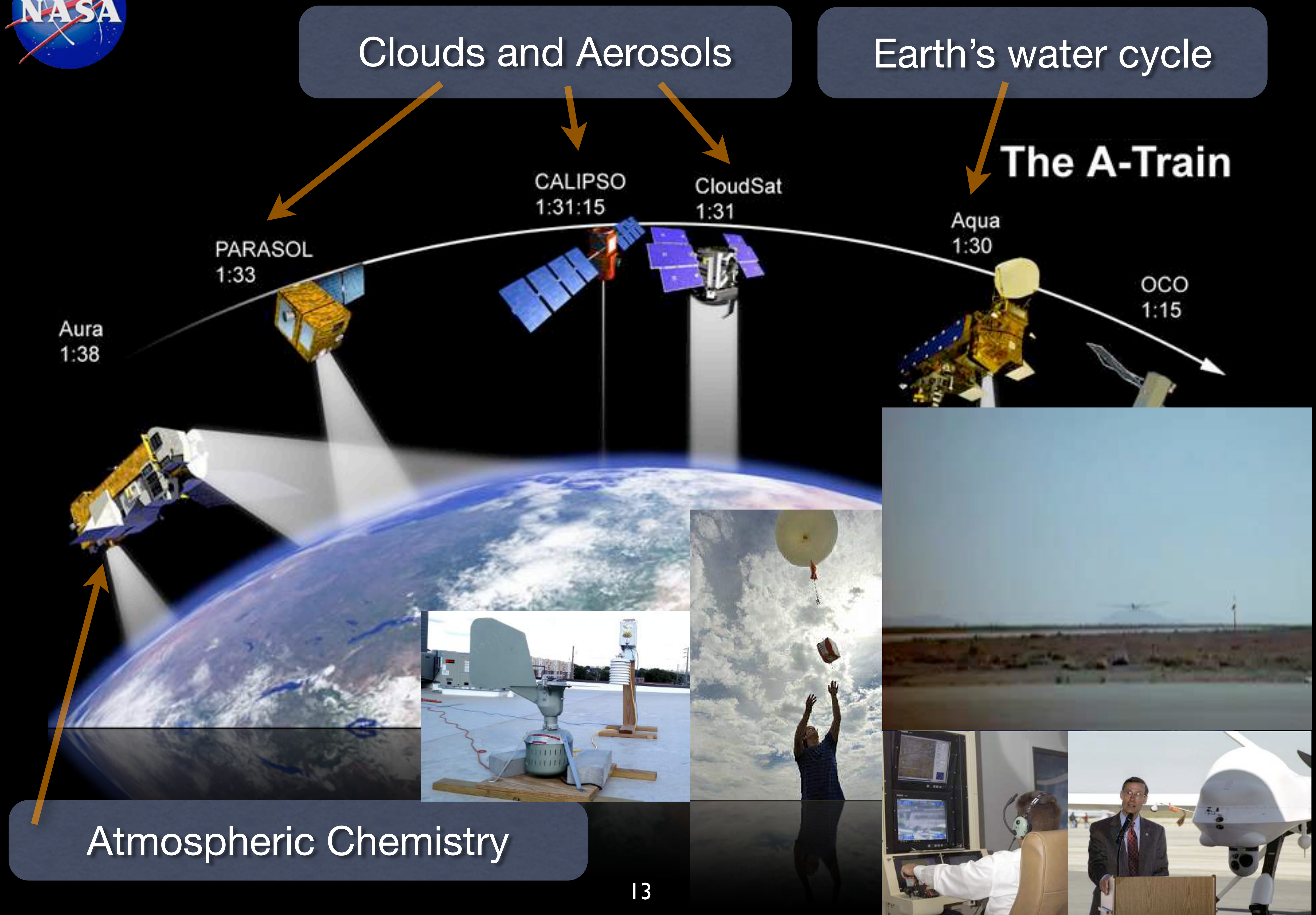
Independent Validation
Note the inclusion of error estimates.

Regional Air Monitoring Network "Meet and Greet" in Joppa Draws Packed House and Volunteers

Hourly Measurements from 55 countries and more than 8,000 measurement sites from 1997-present

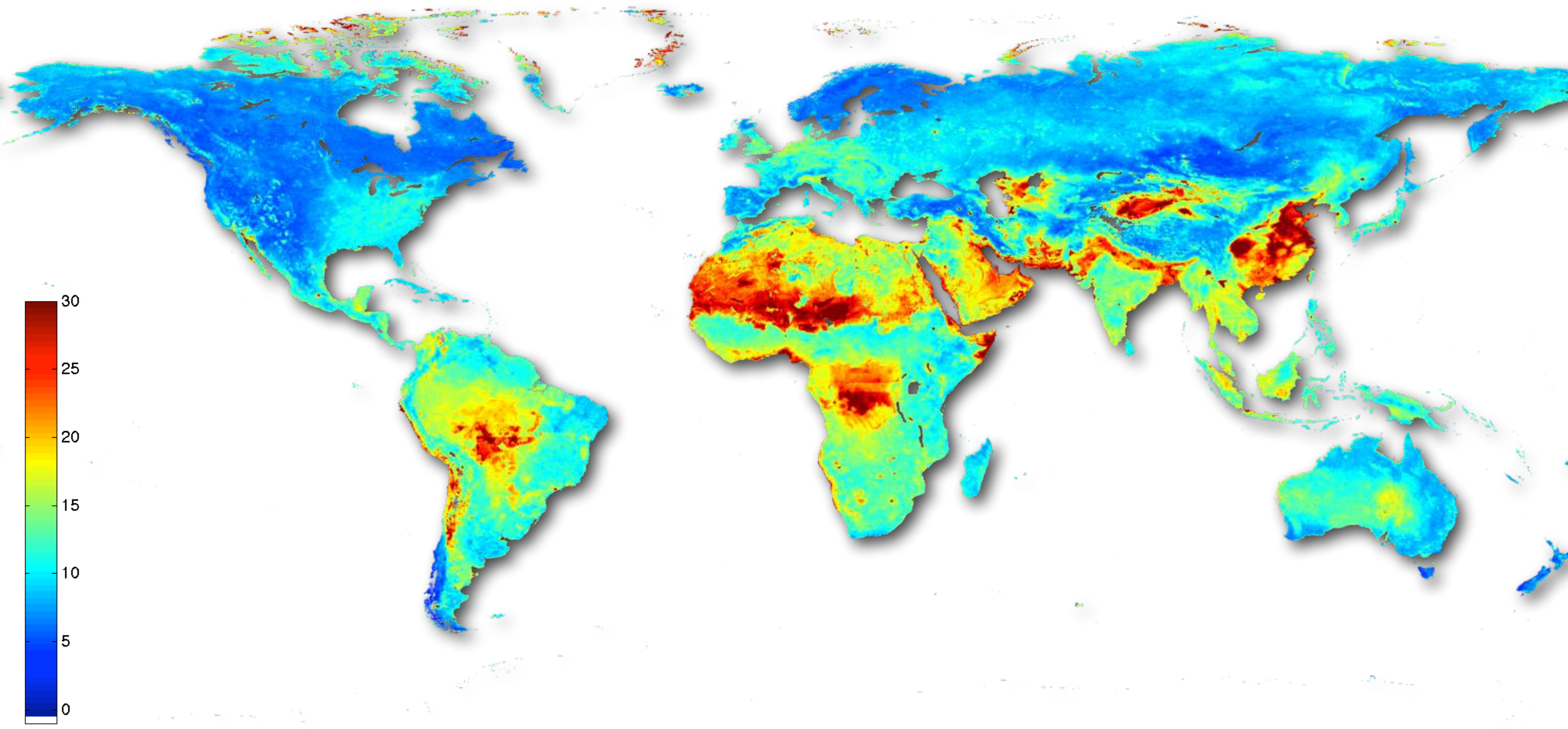


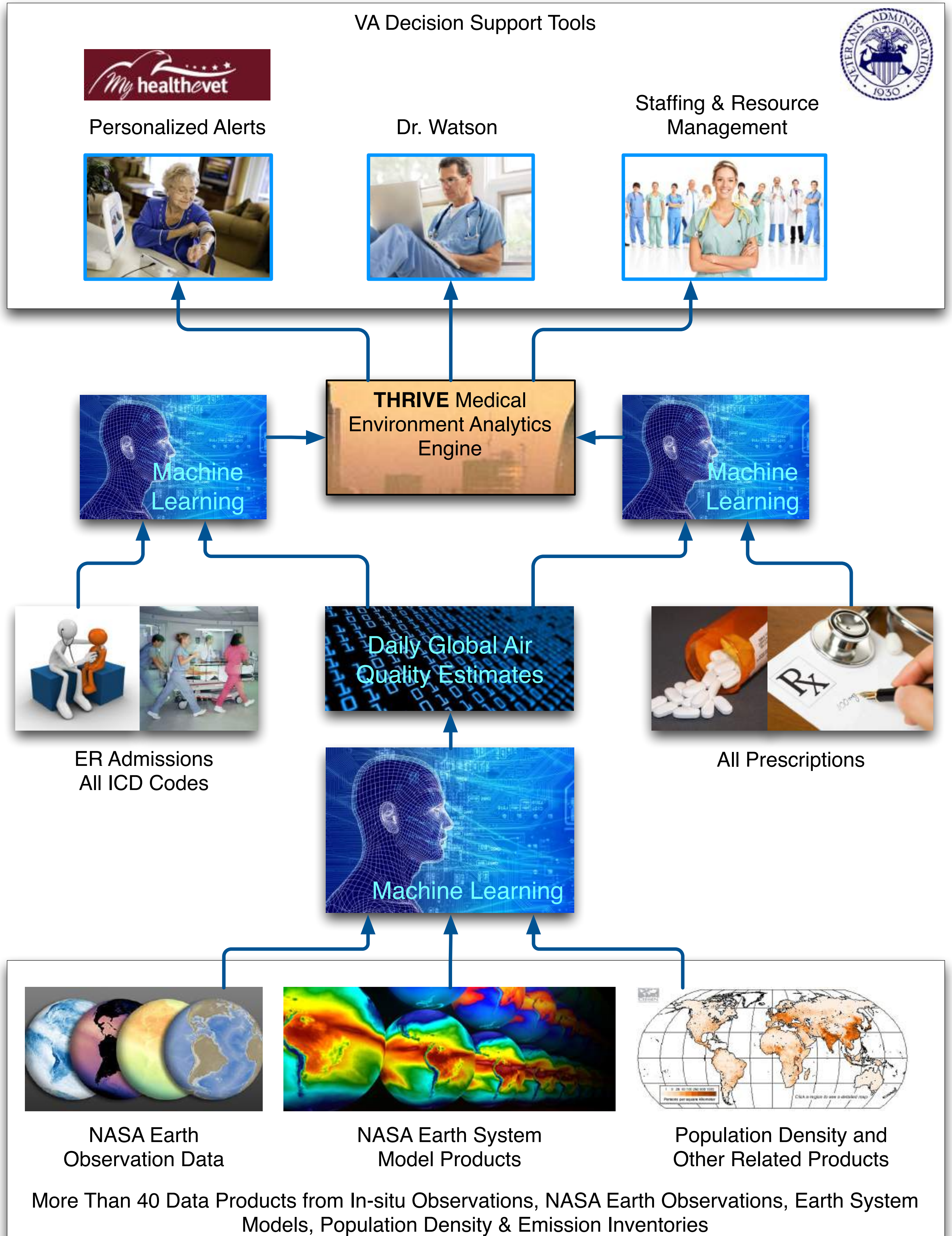
Sensing Assets



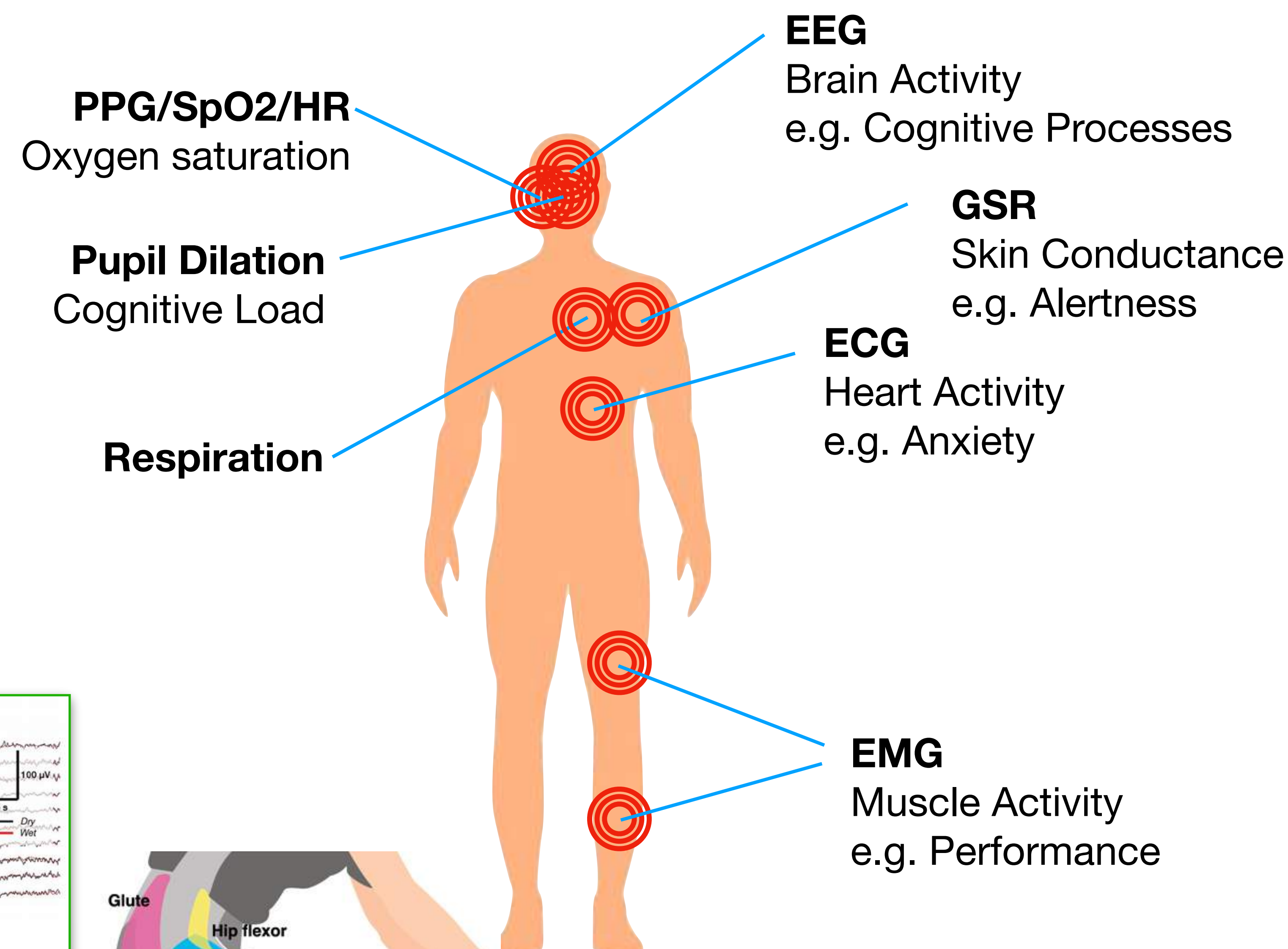
Air Quality: Long-Term Average 1997-present

Used around 40 TB of different BigData sets from satellites, meteorology, demographics, in-situ sensors and scraped web-sites and social media to estimate $PM_{2.5}$.

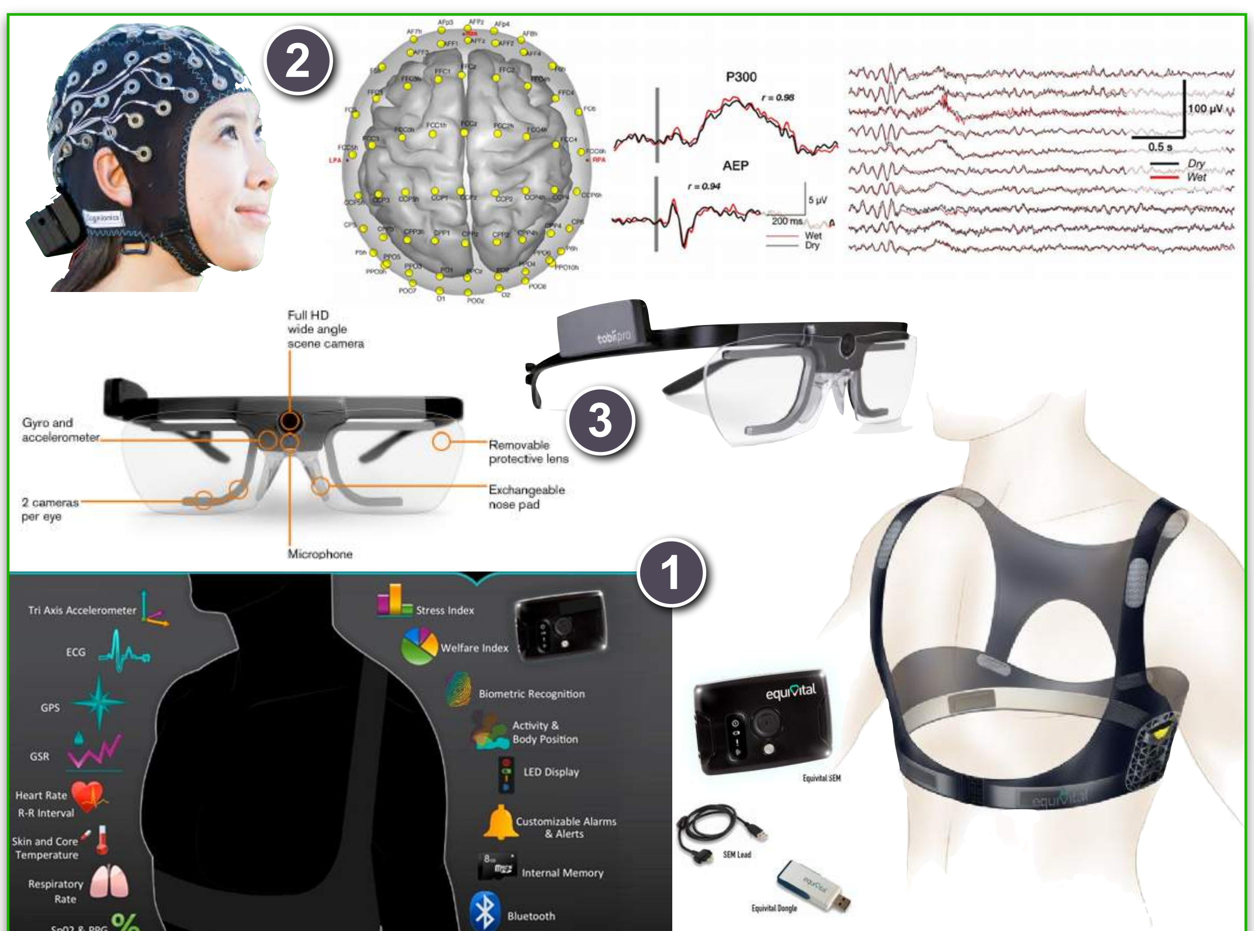


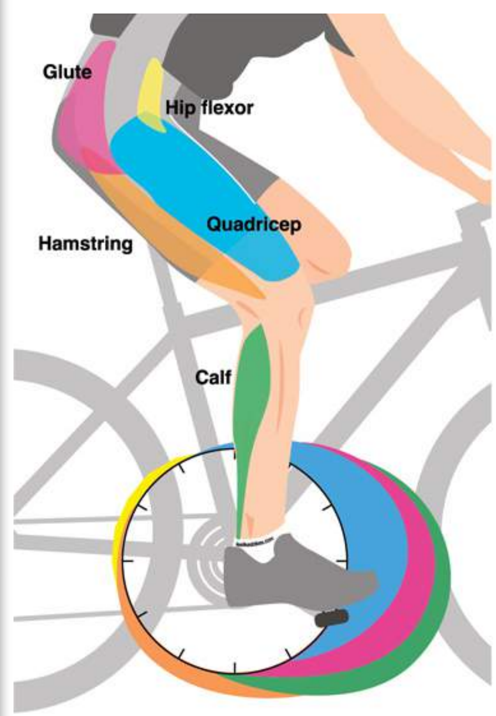

VA Decision Support Tools
My healthevet
Personalized Alerts
Dr. Watson
Staffing & Resource Management
THRIVE Medical Environment Analytics Engine
Machine Learning
Machine Learning
Daily Global Air Quality Estimates
ER Admissions
All ICD Codes
All Prescriptions
Machine Learning
NASA Earth Observation Data
NASA Earth System Model Products
Population Density and Other Related Products
More Than 40 Data Products from In-situ Observations, NASA Earth Observations, Earth System Models, Population Density & Emission Inventories

Biometric Measurements

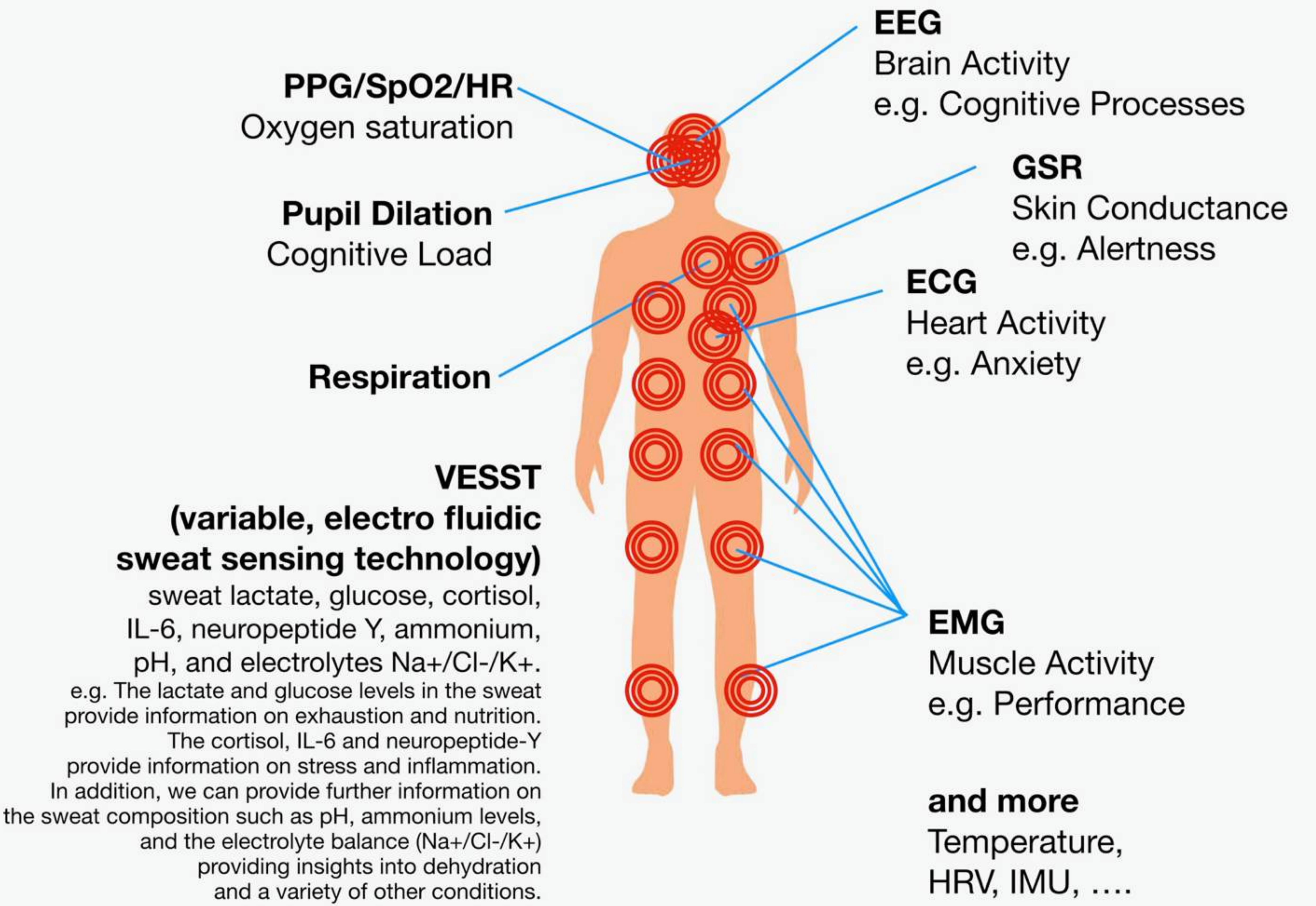


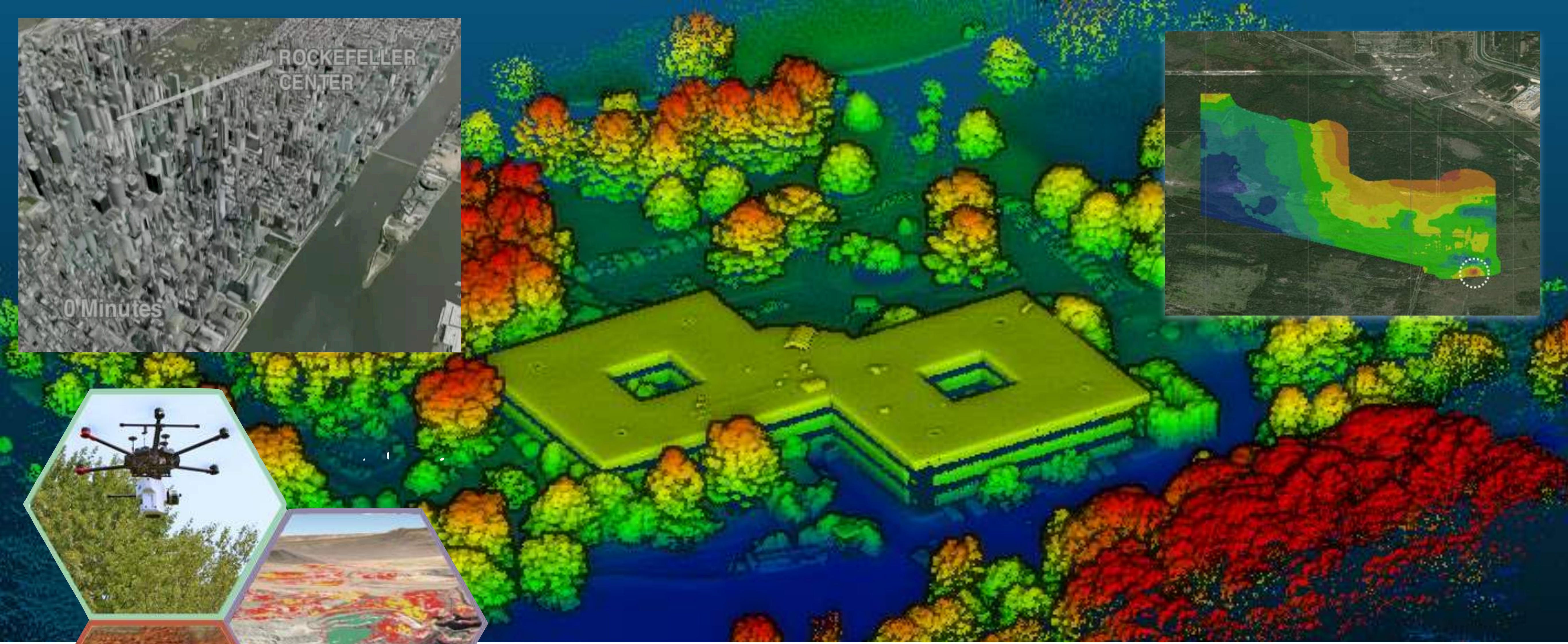
and more
Temperature,
HRV, IMU, ….

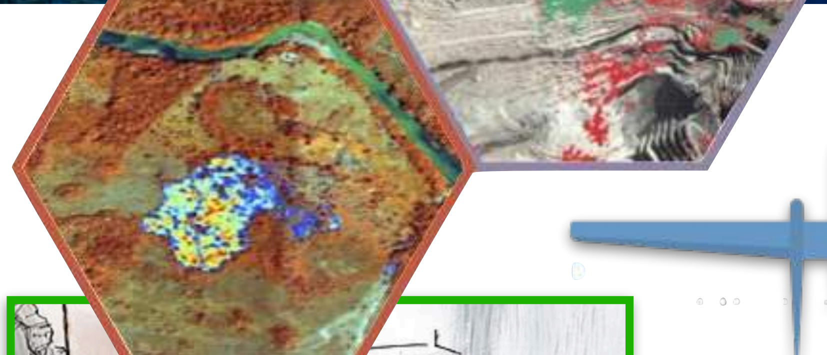




Biometric & Physiological Wearable Sensor Suite

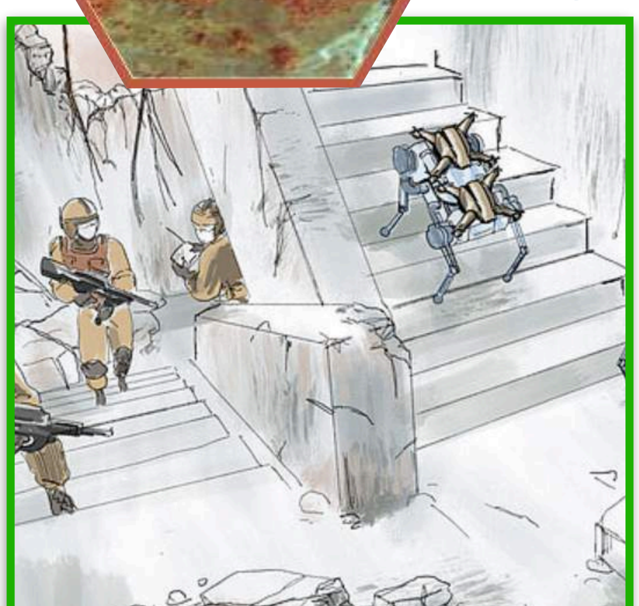


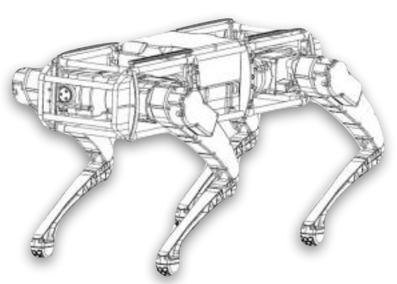




Synergistic Robots for Safety Surveys (ROSS)

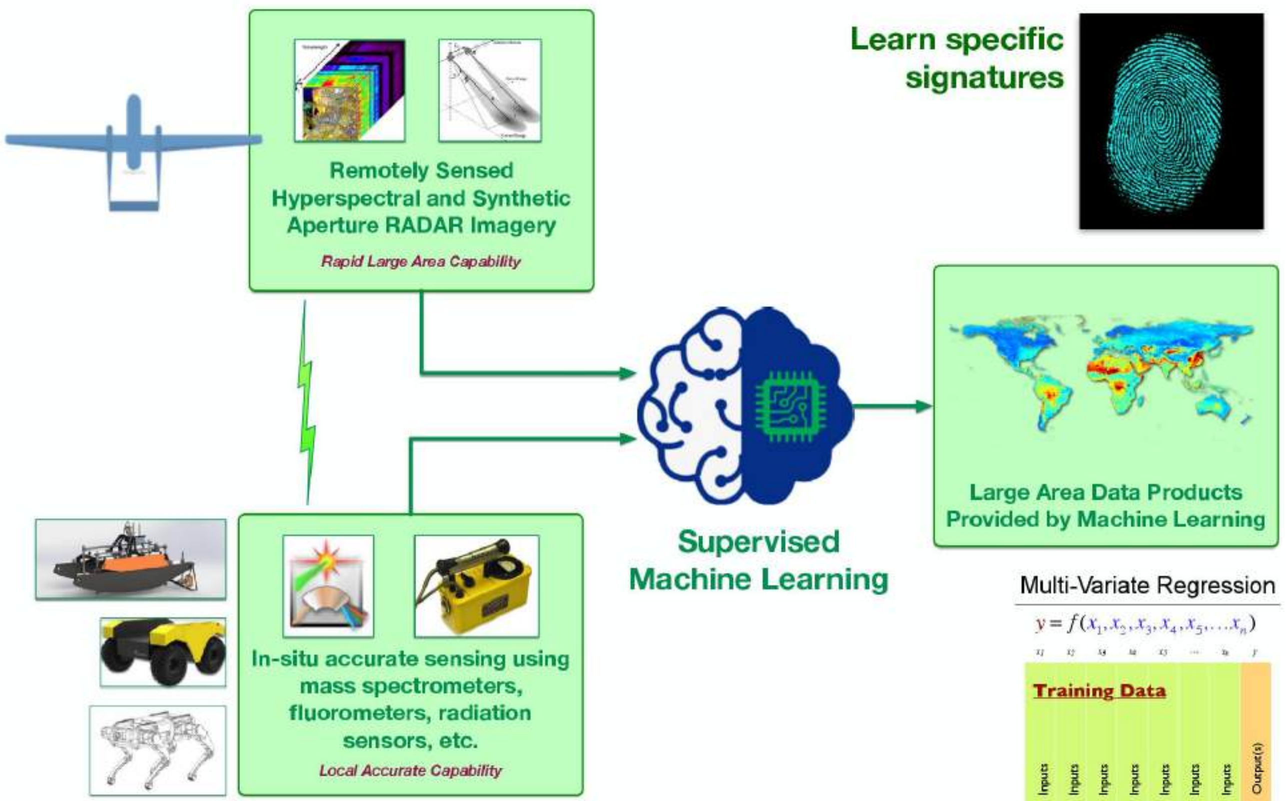
Hanson Center for Space Sciences
University of Texas at Dallas
Prof. David J. Lary



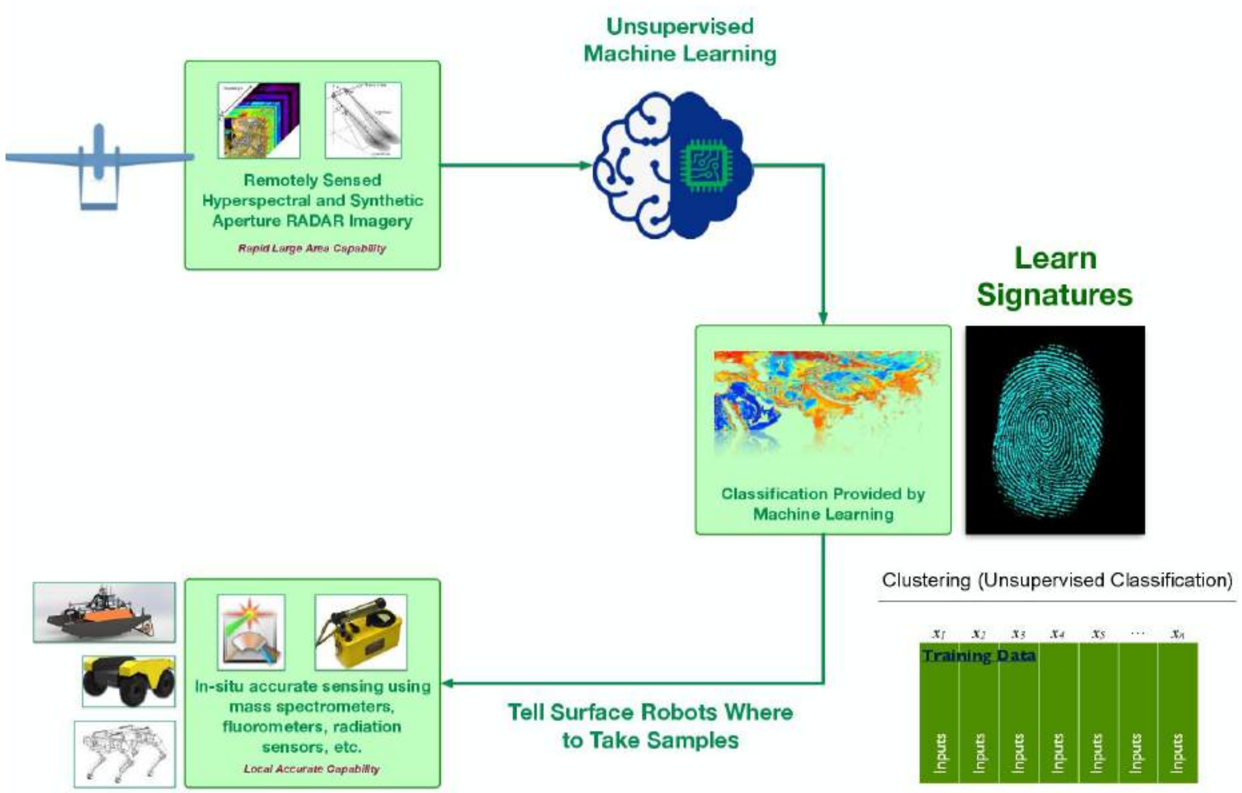


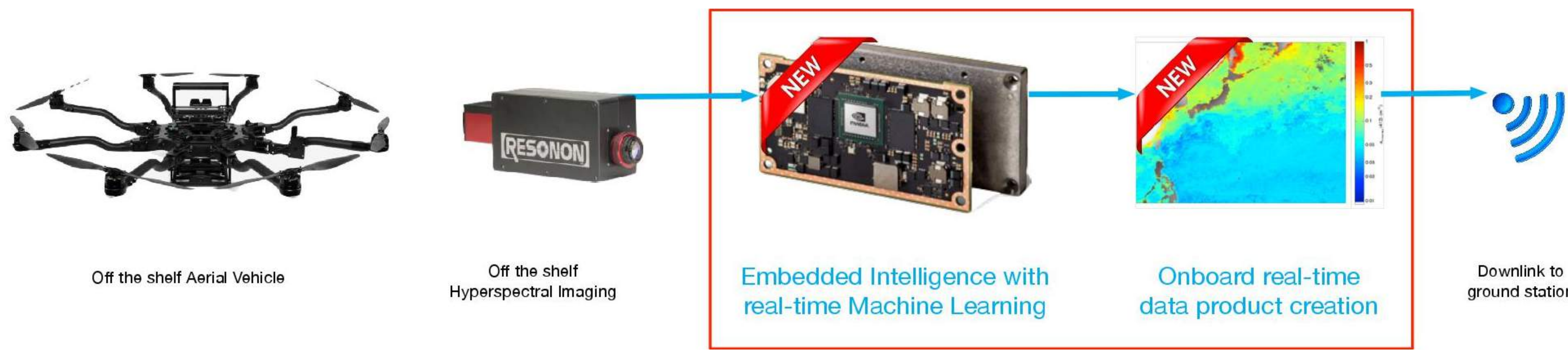
Machine Learning Modes of Operation

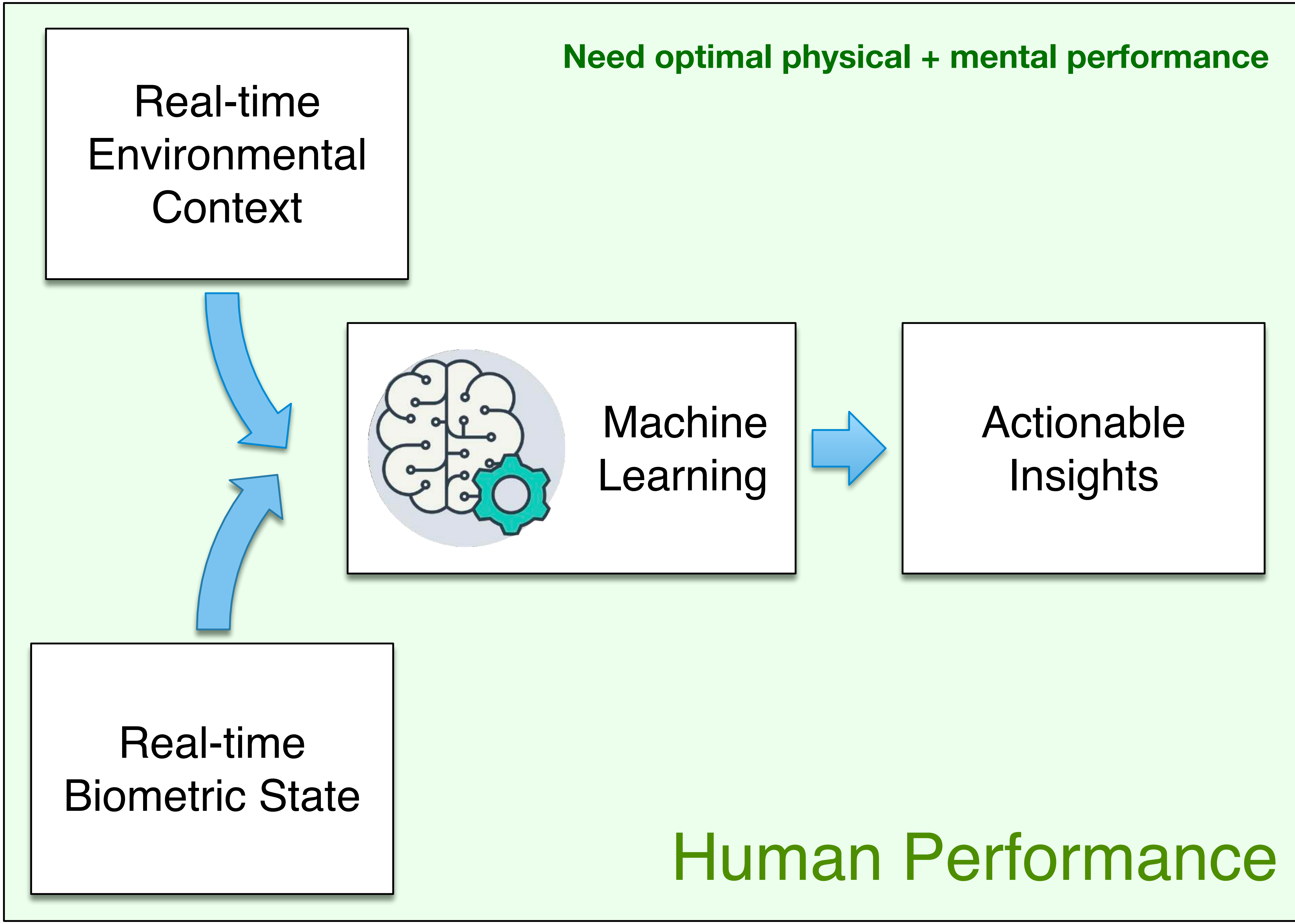
Mode 1: Coordinated robots using onboard Machine Learning for specific data products

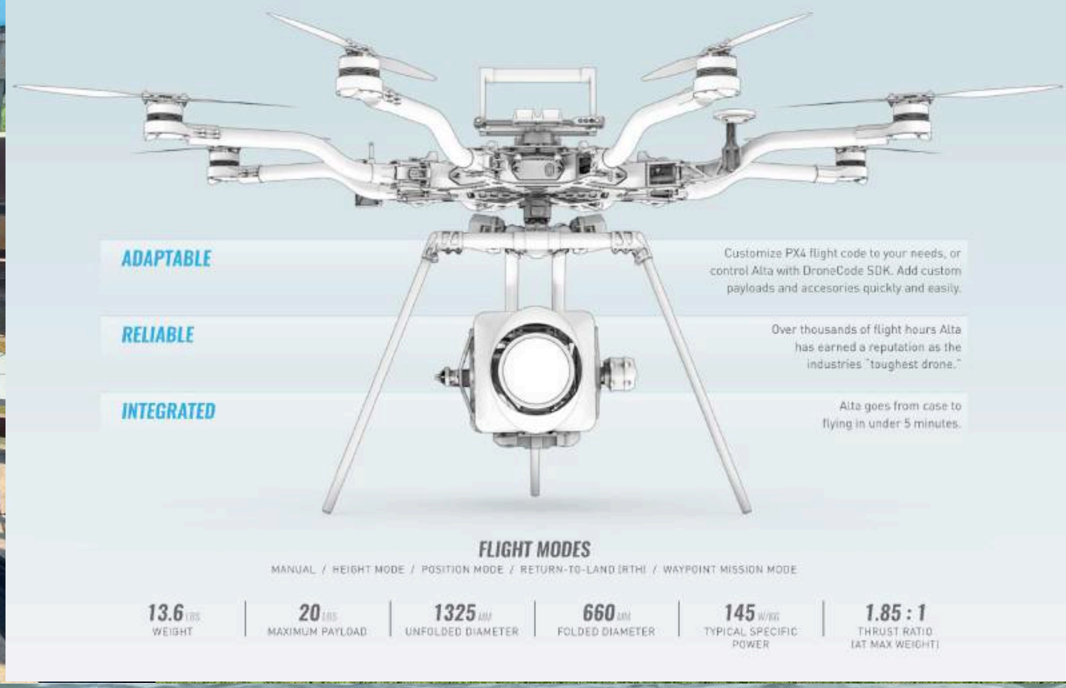


Mode 2: Unsupervised classification






Need optimal physical + mental performance
Real-time Environmental Context
Real-time Biometric State
Machine Learning
Actionable Insights
Human Performance


ADAPTABLE
Customize PX4 flight code to your needs, or control Alta with DroneCode SDK. Add custom payloads and accesories quickly and easily.
RELIABLE
Over thousands of flight hours Alta has earned a reputation as the industries "toughest drone."
INTEGRATED
Alta goes from case to flying in under 5 minutes.
FLIGHT MODES
MANUAL / HEIGHT MODE / POSITION MODE / RETURN-TO-LAND (RTH) / WAYPOINT MISSION MODE
13.6 LBS WEIGHT
20 LBS MAXIMUM PAYLOAD
1325 MM UNFOLDED DIAMETER
660 MM FOLDED DIAMETER
145 W/KG TYPICAL SPECIFIC POWER
1.85 : 1 THRUST RATIO (AT MAX WEIGHT)


MARITIME ROBOTICS