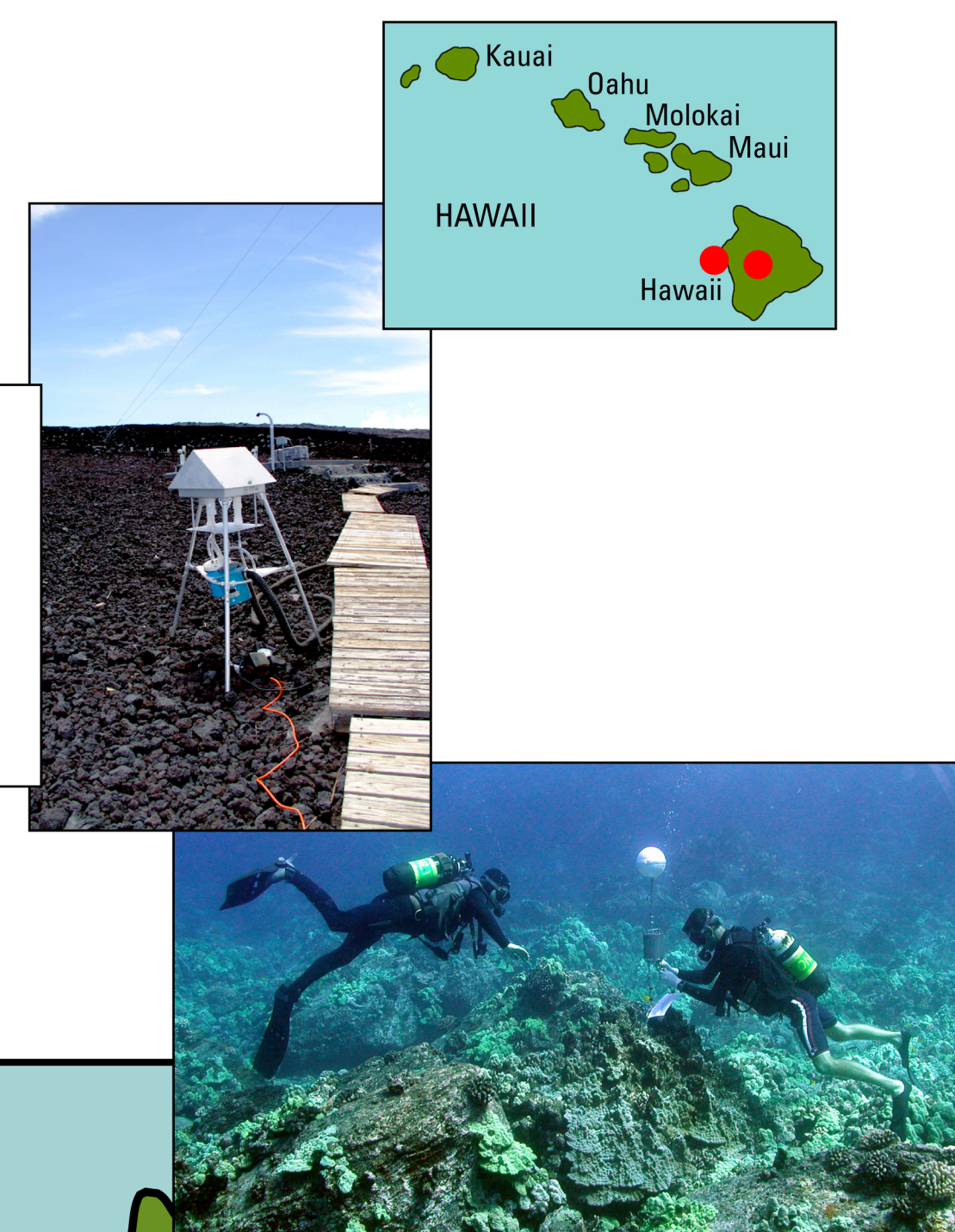


# AFRICAN AND ASIAN DUST, CORAL REEFS, AND HUMAN HEALTH

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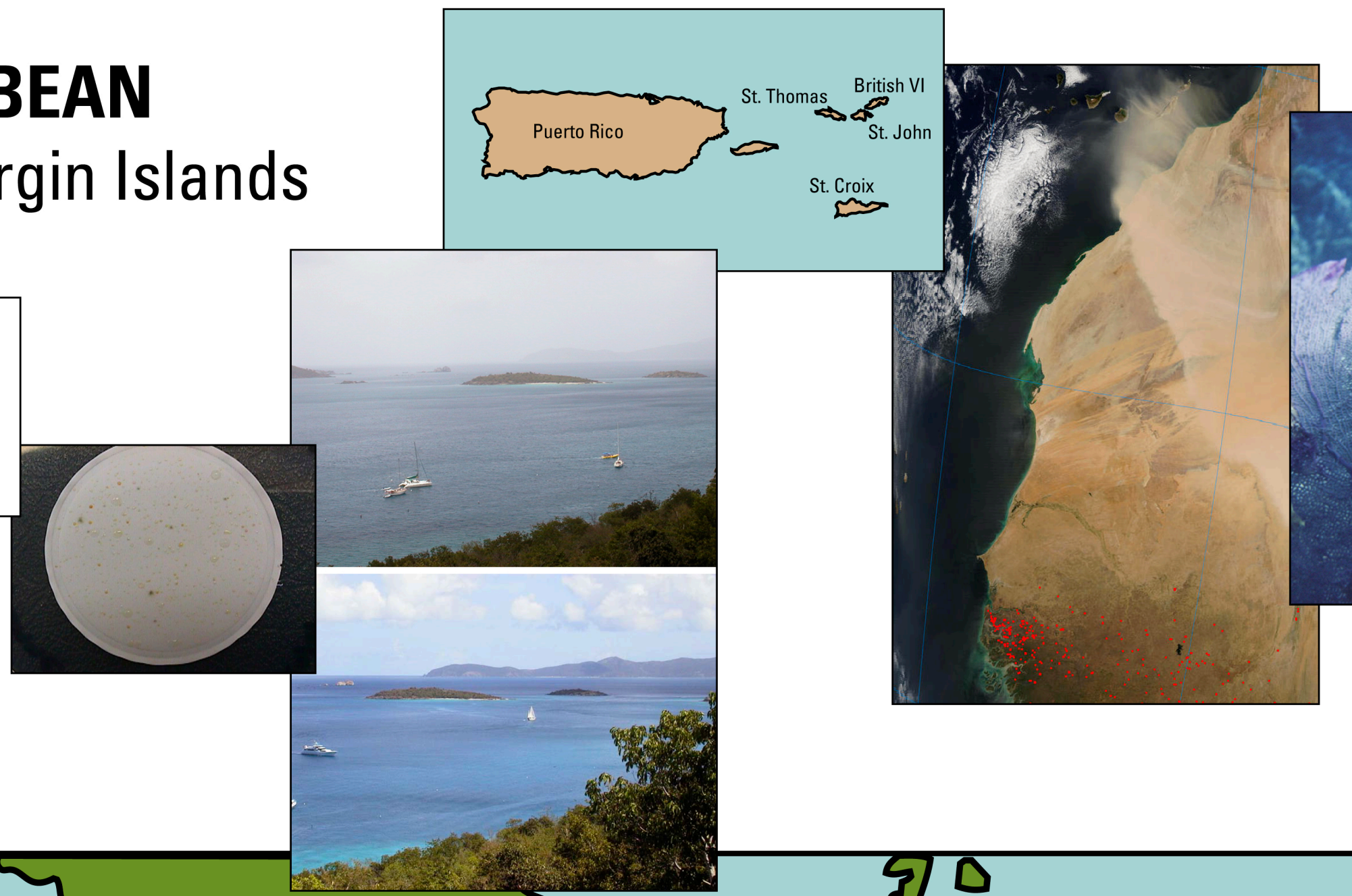
## CENTRAL PACIFIC Hawaii

- Collaborators in Hawaii**
- Mauna Loa Observatory, NOAA
  - WRD, USGS
  - State of Hawaii DAR
  - Fish & Wildlife Service



## NORTHEASTERN CARIBBEAN St. John & St. Croix, US Virgin Islands

- Collaborators in Virgin Islands**
- Virgin Islands National Park
  - University of the Virgin Islands
  - VI Territorial Marine Park



## SAHEL Bamako, Mali

- Collaborators in Mali**
- Ministry of Geology & Mines
  - Ministry of Communications
  - University of Mali, Faculty of Science & Technology

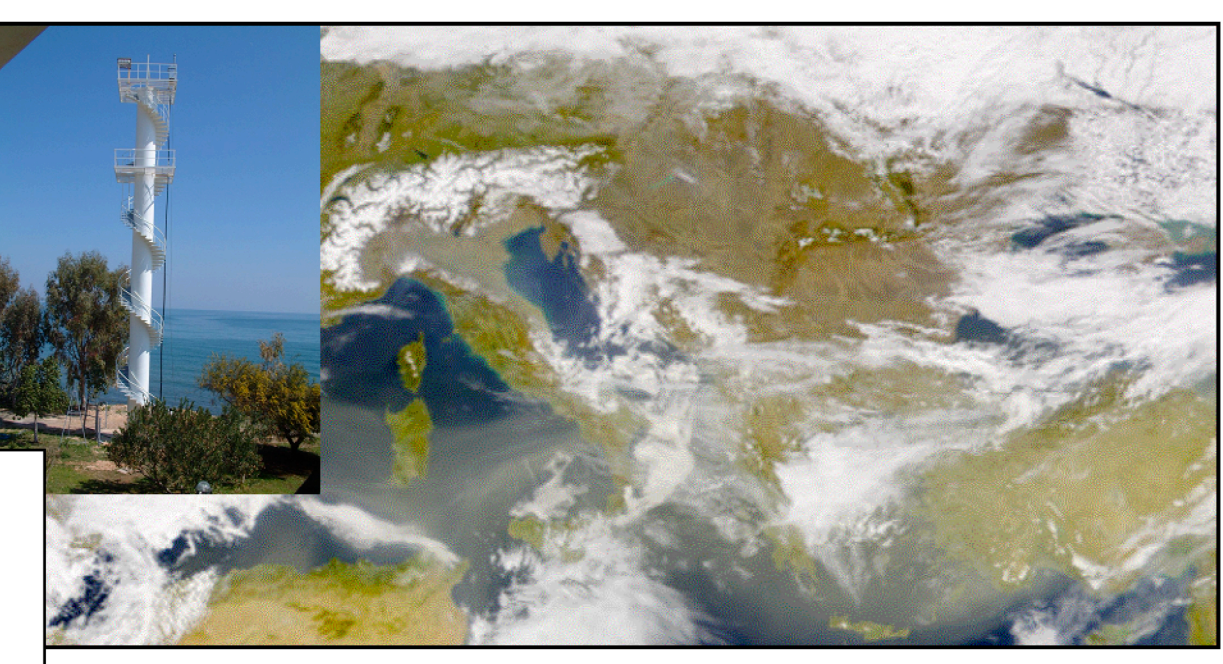


## OVERVIEW

Hundreds of millions of tons of African dust are transported annually from the Sahara and Sahel to the Caribbean and southeastern U.S. A similar dust system in Asia carries dust from the Gobi and Taklimakan deserts across Korea, Japan, and the northern Pacific to the Hawaiian Islands, the western U.S., to Europe and beyond. Although these global atmospheric systems have been transporting fine soil particles for hundreds of thousands of years, the quantities of dust vary annually as a result of global climate, local meteorology, geomorphology of source areas, and human activities. It is thought that the quality of the dust has changed as a result of human-related changes in the source regions and areas over which the dust travels: burning of biomass and waste; use of antibiotics, pharmaceuticals, and pesticides; increased industrialization. We hypothesize that air masses carrying African and Asian dust transport living microorganisms and synthetic organic chemicals thousands of kilometers and that these chemical and microbial contaminants are adversely affecting coral reefs and human health.

## MEDITERRANEAN Erdemli-Icel, Turkey

- Collaborator in Turkey**
- Middle East Technical University



## CAPE VERDE Sal Island

- Collaborator in Cape Verde**
- National Institute of Meteorology and Geophysics



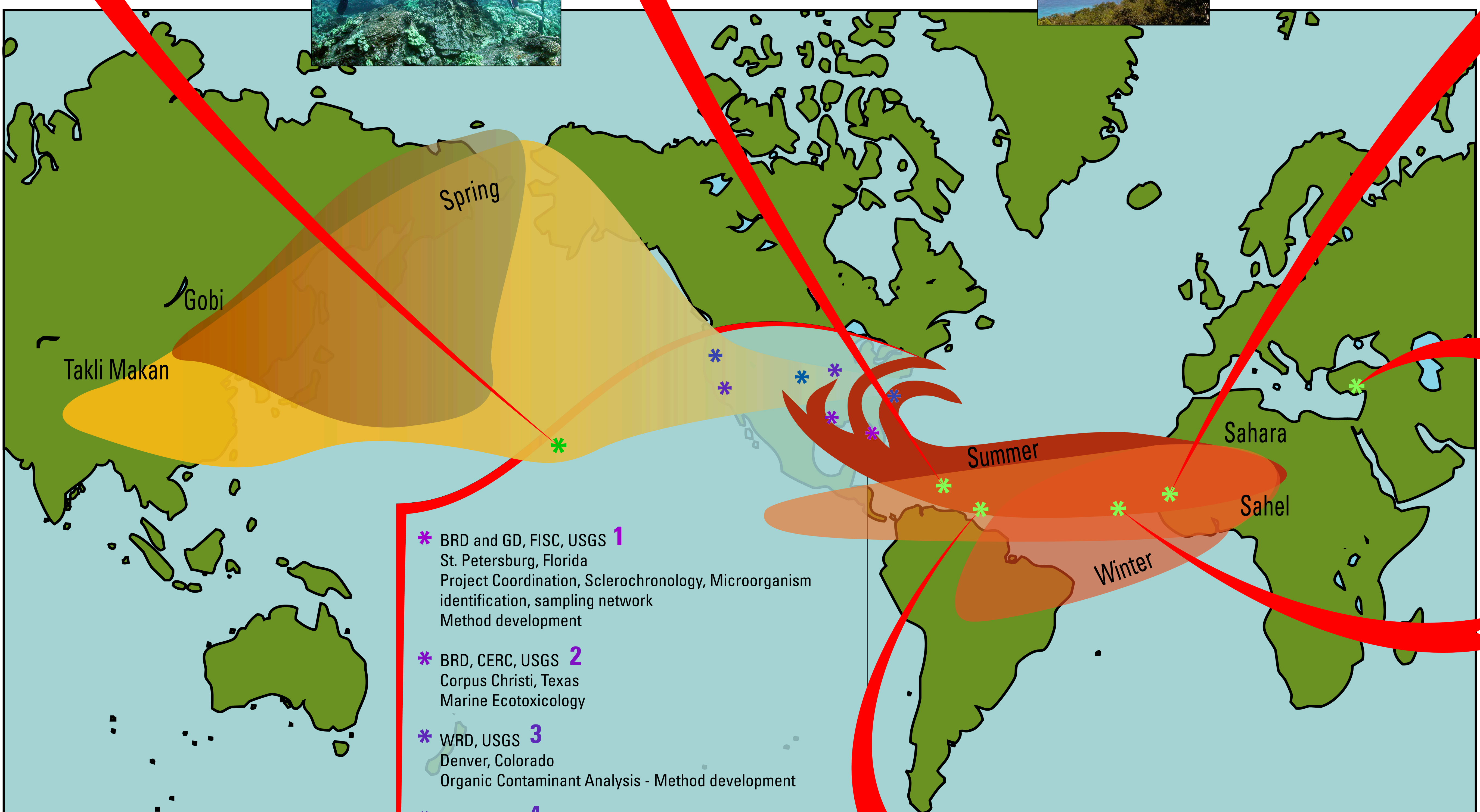
## SOUTHEASTERN CARIBBEAN Galera Point, Trinidad

- Collaborators in Trinidad**
- University of the West Indies<sup>8</sup>
  - Environmental Management Authority
  - Maritime Services



## SUMMARY OF FINDINGS FROM AFRICAN DUST SYSTEM INVESTIGATIONS

1. Synthetic organic chemical contaminants (pesticides, PAHs and PCBs) have been identified in air samples from the US Virgin Islands (USVI) and Trinidad during dust conditions and from Mali. Air samples from Mali contained higher concentrations of the same suite of organic contaminants than USVI and Trinidad air samples. Many of the contaminants are known endocrine disruptors.
2. As of August 2005, preliminary identification has been made of >300 species of microorganisms cultured from air samples collected on St. Croix, St. John (USVI) and Trinidad during dust and non-dust conditions. Air samples collected during dust events in the USVI and Trinidad contain approximately 2-3 times as many culturable microorganisms per volume as do air samples collected during non-dust conditions. Of those species identified to date, 25% are known plant pathogens and 10% are known opportunistic pathogens of humans.
3. Air in Mali contains orders of magnitude more microorganisms per volume than air sampled in the downwind areas (USVI and Trinidad) and more species. Of the hundreds of microorganisms cultured and isolated from Sahara and Sahel (Mali, West Africa) air samples, DNA sequencing has been used to identify 50 species of bacteria (and 3 genera of fungi). Of the culturable bacteria identified thus far, 10% are known animal pathogens, 5% are plant pathogens, and 27% are opportunistic human pathogens.
4. A pilot study found that dust collected in the VI during African dust conditions was toxic to gametes and embryos of some marine organisms.
5. The pathogenic strain of the fungus known to cause sea fan disease and mortality of sea fans throughout the Caribbean region has been isolated from:
  - a. lesions of diseased sea fans
  - b. air samples collected in the USVI during African dust conditions but not from non-dust periods
  - c. soil from the Sahel (Mali)
  - d. sediment from the Gulf of Paria (SE Caribbean) near the mouth of the Orinoco River



- \* BRD and GD, FISC, USGS <sup>1</sup>  
St. Petersburg, Florida  
Project Coordination, Sclerochronology, Microorganism identification, sampling network  
Method development
- \* BRD, CERC, USGS <sup>2</sup>  
Corpus Christi, Texas  
Marine Ecotoxicology
- \* WRD, USGS <sup>3</sup>  
Denver, Colorado  
Organic Contaminant Analysis - Method development
- \* WRD, USGS <sup>4</sup>  
Sacramento, California  
Organic Contaminant Analysis - Method development
- \* Oregon State University <sup>5</sup>  
Corvallis, Oregon  
Organic Contaminant Analysis
- \* University of South Carolina, Aiken <sup>6</sup>  
Marine Microorganisms
- \* GD, USGS  
Denver, Colorado  
Metals Analysis
- \* BRD, CERC, USGS <sup>7</sup>  
Columbia, Missouri  
Organic Contaminant Analysis - Reef waters
- \* University of the West Indies <sup>8</sup>  
Environmental Management Authority  
Maritime Services