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Avian Considerations and Offshore Wind in the California Current

Presented by
Scott Terrill, PhD
October 25, 2018

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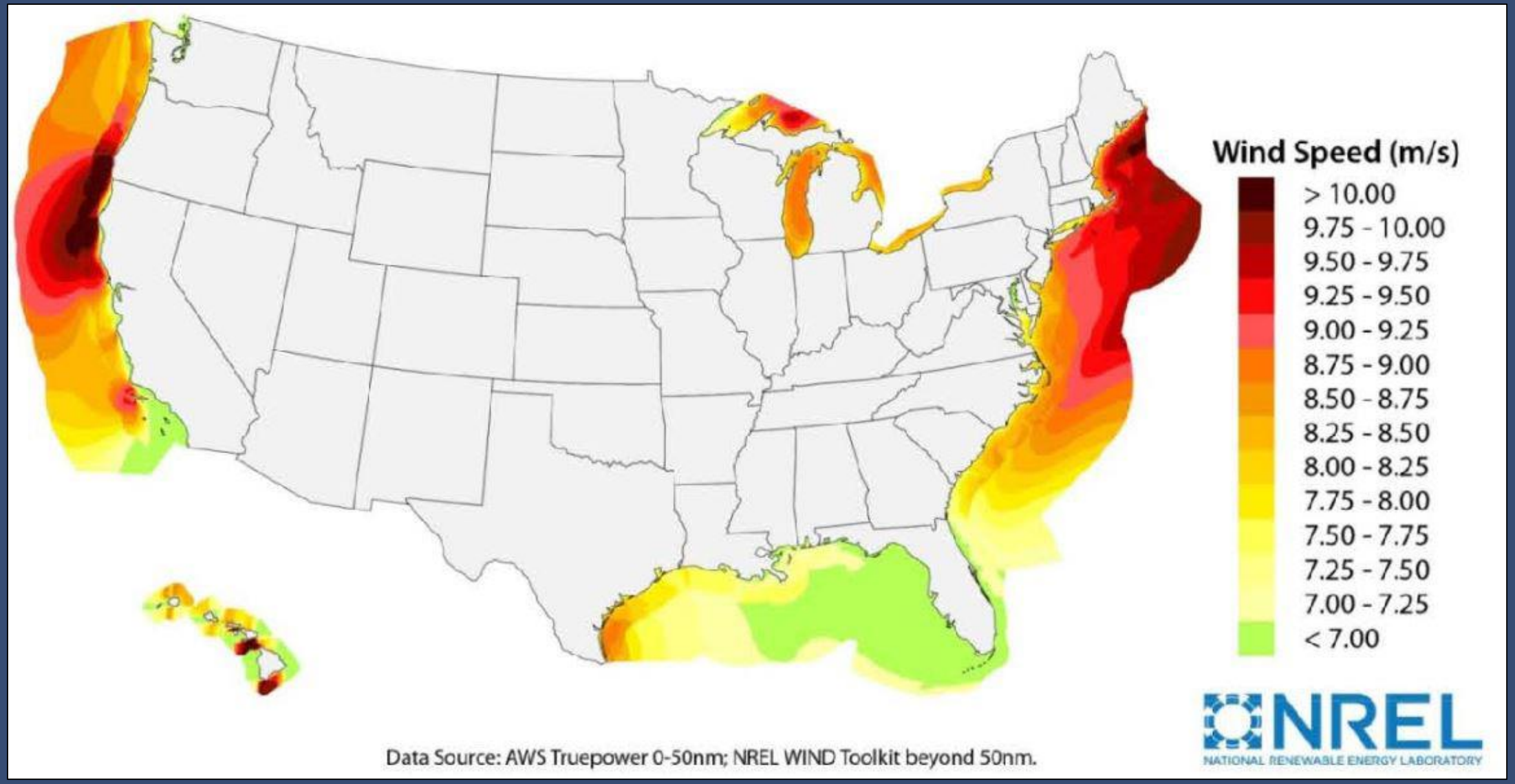
Ecological Consultants

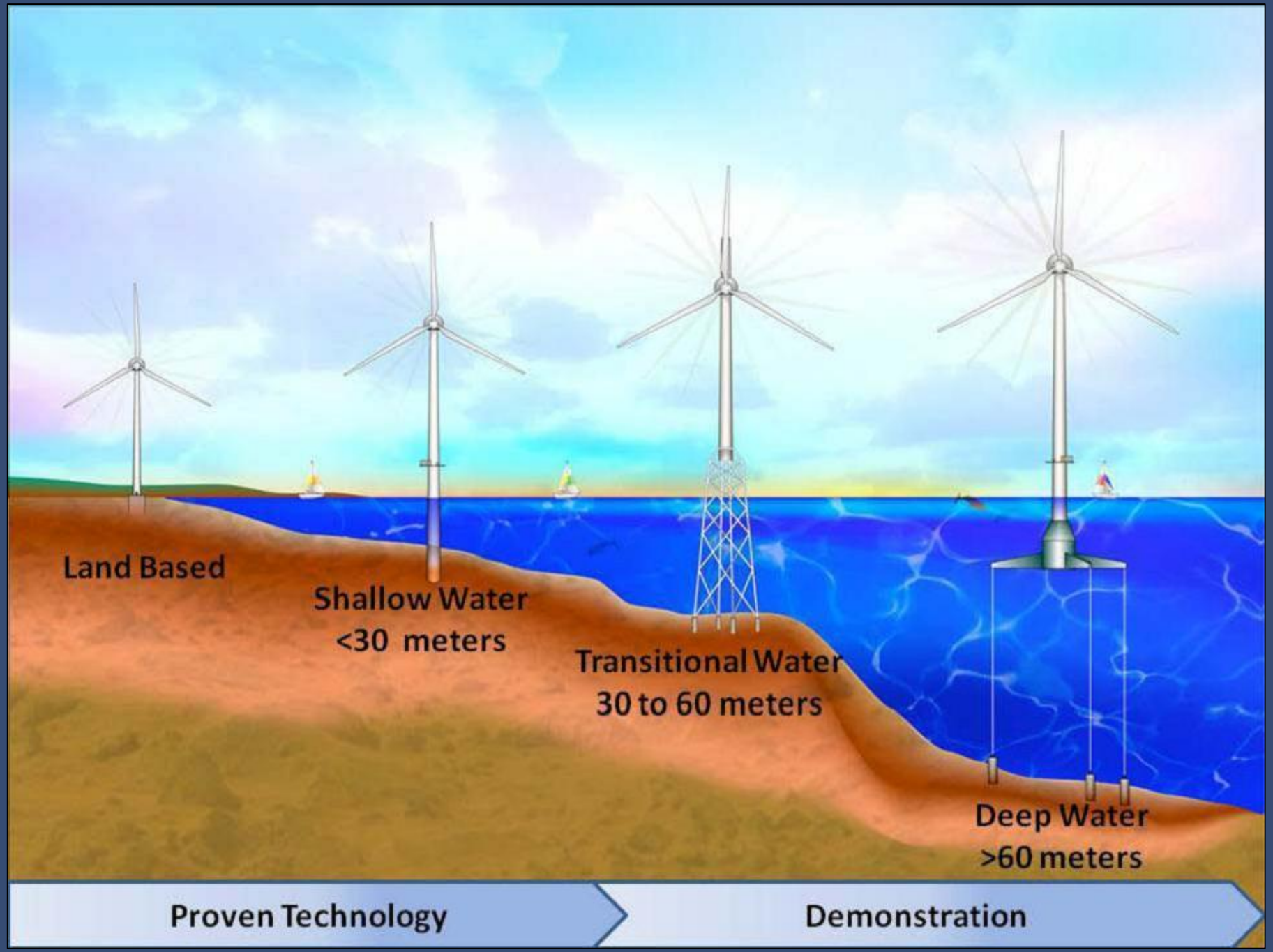
Offshore Wind Energy Resource Map



Current Offshore Wind Projects (Europe, East Coast) are in Relatively Shallow Water

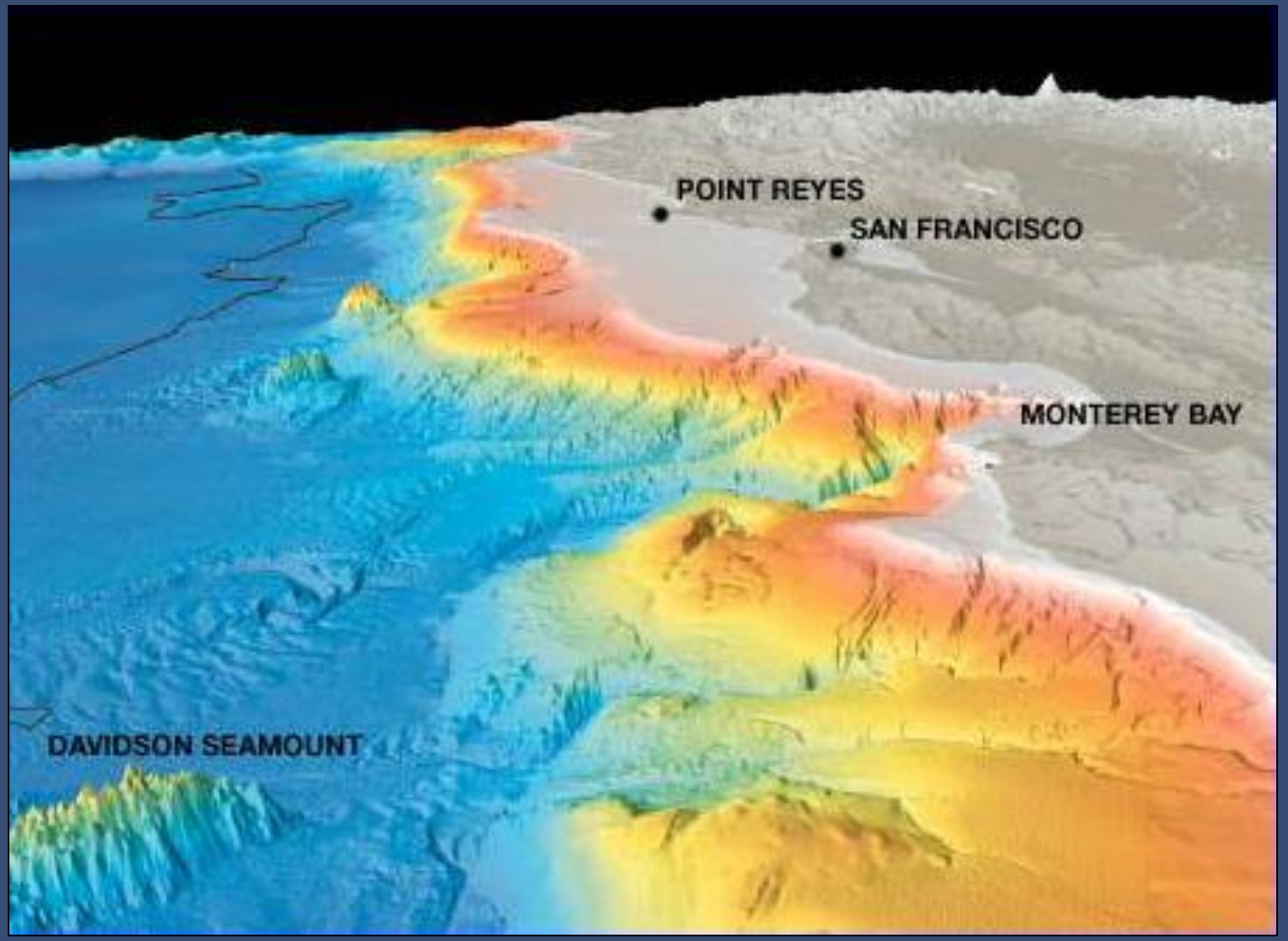
Projects off California are currently considering floating platforms in deep water.

Full-scale floating offshore wind turbines have been successfully deployed over multiple years and survived extreme conditions (e.g., waves > 17m and winds > 60 knots).



NREL

Outer Continental Shelf (OCS) off CA Topographically Diverse, Drops off rapidly



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San Francisco State University

Avian Considerations for Offshore Wind

Marine Birds

- Collision
- Displacement
- Anthropogenic Lighting

Terrestrial Migrants Offshore

- Collision
- Anthropogenic Lighting

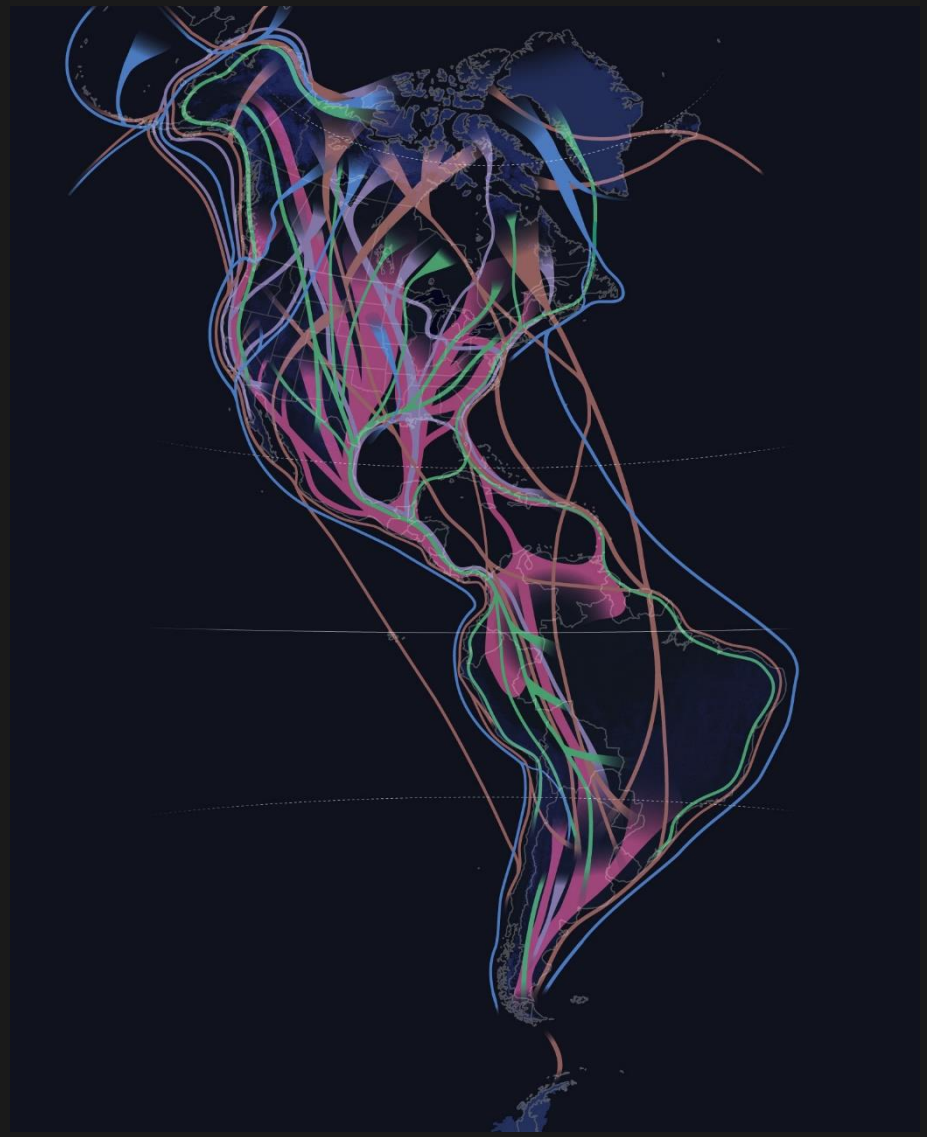
Migrant Terrestrial Birds

- **Much more of a potential issue in Atlantic, North Sea and Gulf of Mexico than off the West Coast**
- **Many terrestrial breeding birds migrate at night**
- **Susceptible to artificial night lighting**
  - Attraction
  - Disorientation
  - Collision
  - Attraction to at-sea structures during inclement weather

Guy Tudor, Life Magazine, 1959©

Landbird Migration Patterns in California

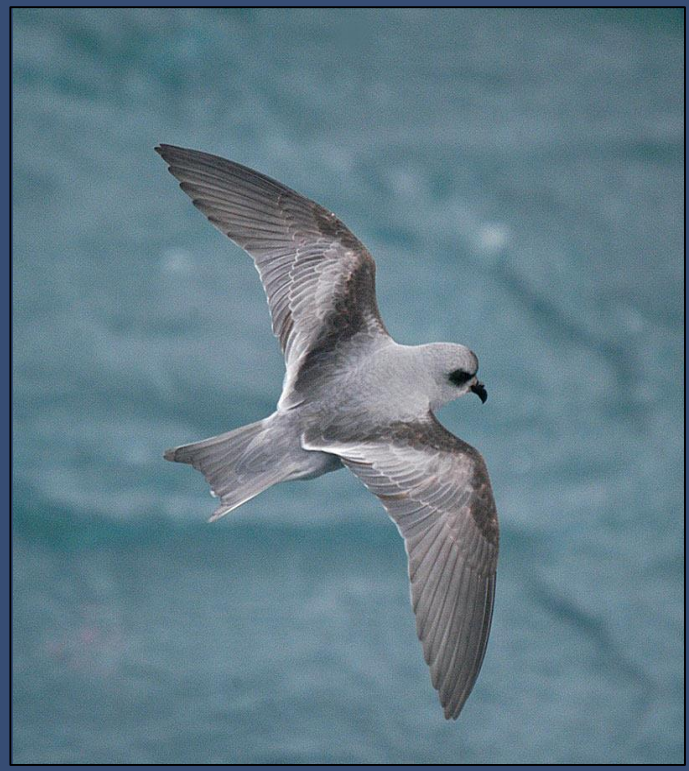
- Due to the northwest to southeast migration of landbirds, they do not “want” to migrate offshore of the west coast of the United States
- Disoriented migrants and “drifting” migrants wind up offshore, but it is relatively rare event and typically weather dependent
- Probably not a major issue off California, at least not far offshore



National Geographic

General Considerations for Seabirds

- Collision
- Displacement
- Habitat Loss
- Lighting
- Spills



Many Studies and Monitoring Efforts in the Atlantic

- Some of the results with similar species groups in both oceans, especially in the nearshore environment, may be extrapolated to Pacific - especially nearshore - but are not applicable for many species in the California Current, especially over the outer continental shelf

- Major differences regarding species in the Pacific are even more pronounced off the outer continental shelf

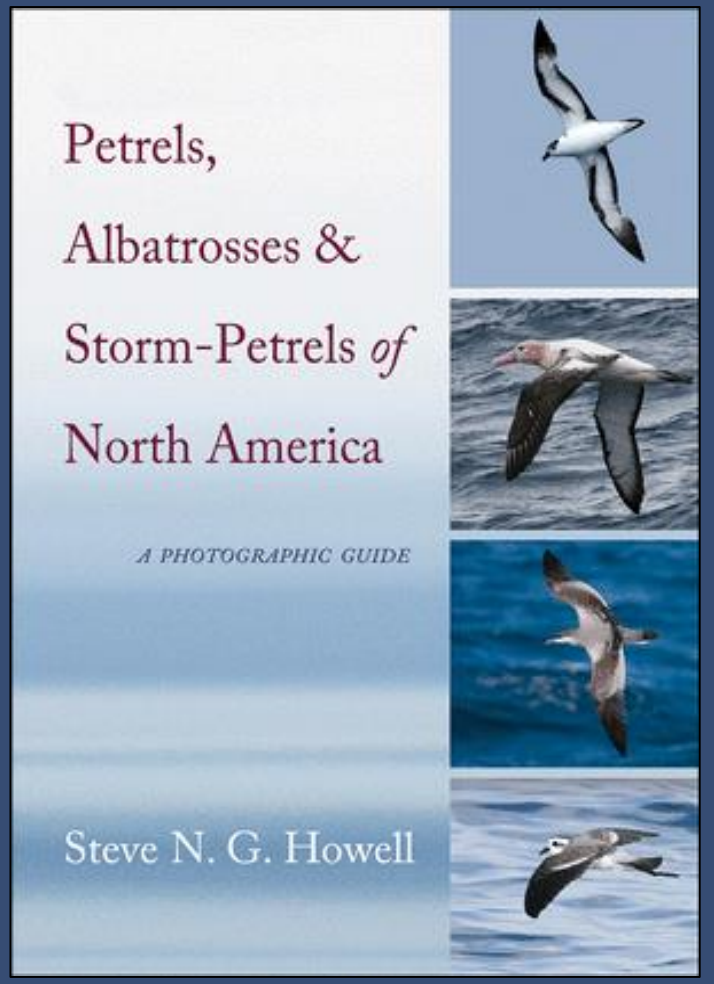
California Current Differs from East Coast and Europe

The California Current has

- **Greater abundance of seabirds**
- **More complex and diverse species composition**

  Especially true for albatrosses, shearwaters, and petrels(whose flight behavior and flight height is especially sensitive to wind strength)

- **Narrow continental shelf means oceanic species are closer to coast**

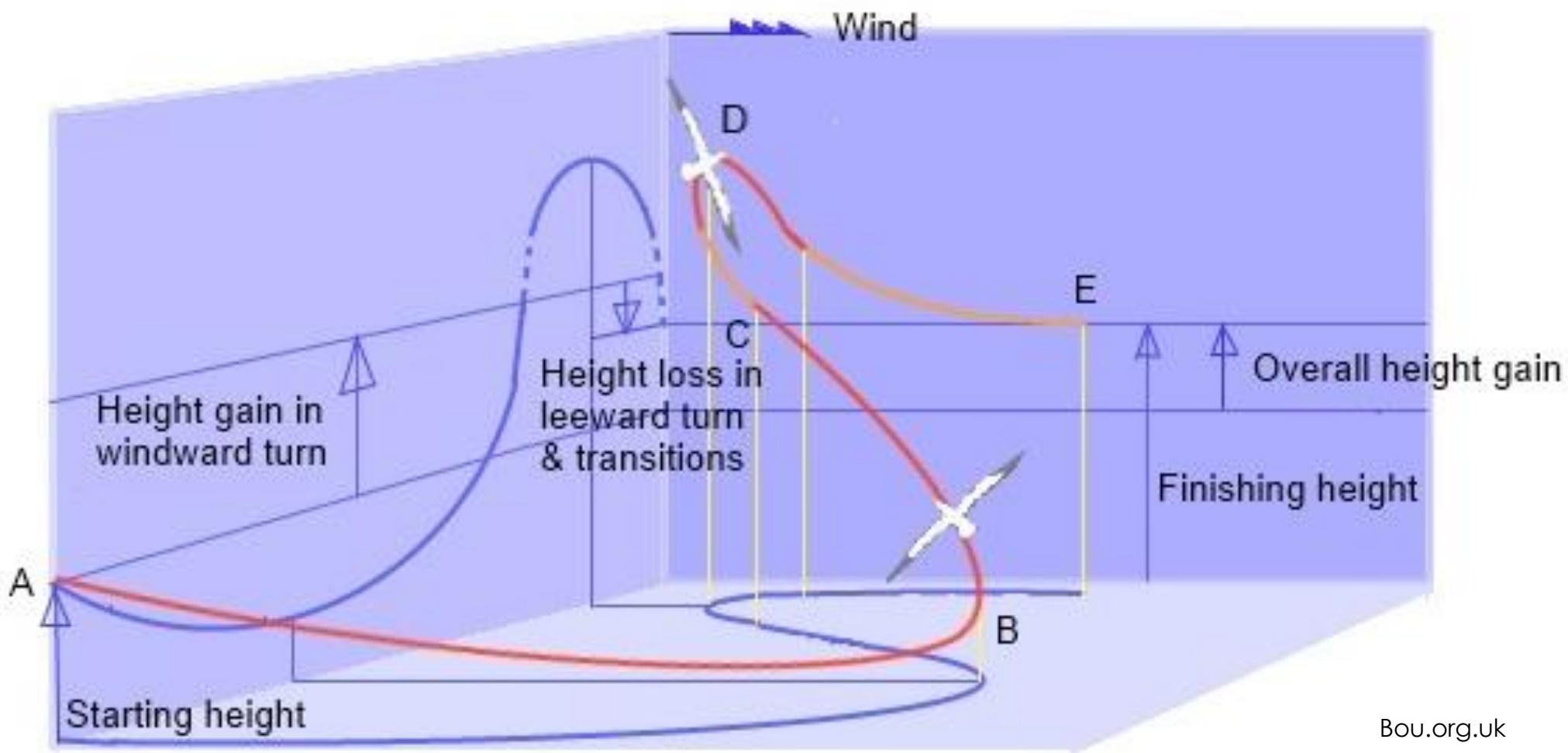


Nearshore Atlantic vs. Offshore Pacific

Offshore "gliders" tend to fly low to the water but arc up high above the water during windy conditions

Nearshore "flappers" tend to fly low to the water, except at times during migration - are less subject to wind

Figure 1
The Dynamic Soaring Manoeuvre



Bou.org.uk

Many Species Migrate to the California Current

Tgreybirds.com

ucsc.edu

Potential Avian Research Priorities for Offshore Wind Projects off California

1) Risk Modelling

- Modeling could indicate areas of higher potential risk to seabirds relative to other areas off California. For the California Current, copious data are available on seabird occurrence, density hotspots, and flight behavior as a function of wind speed.

2) Remote Monitoring Instrumentation Packages

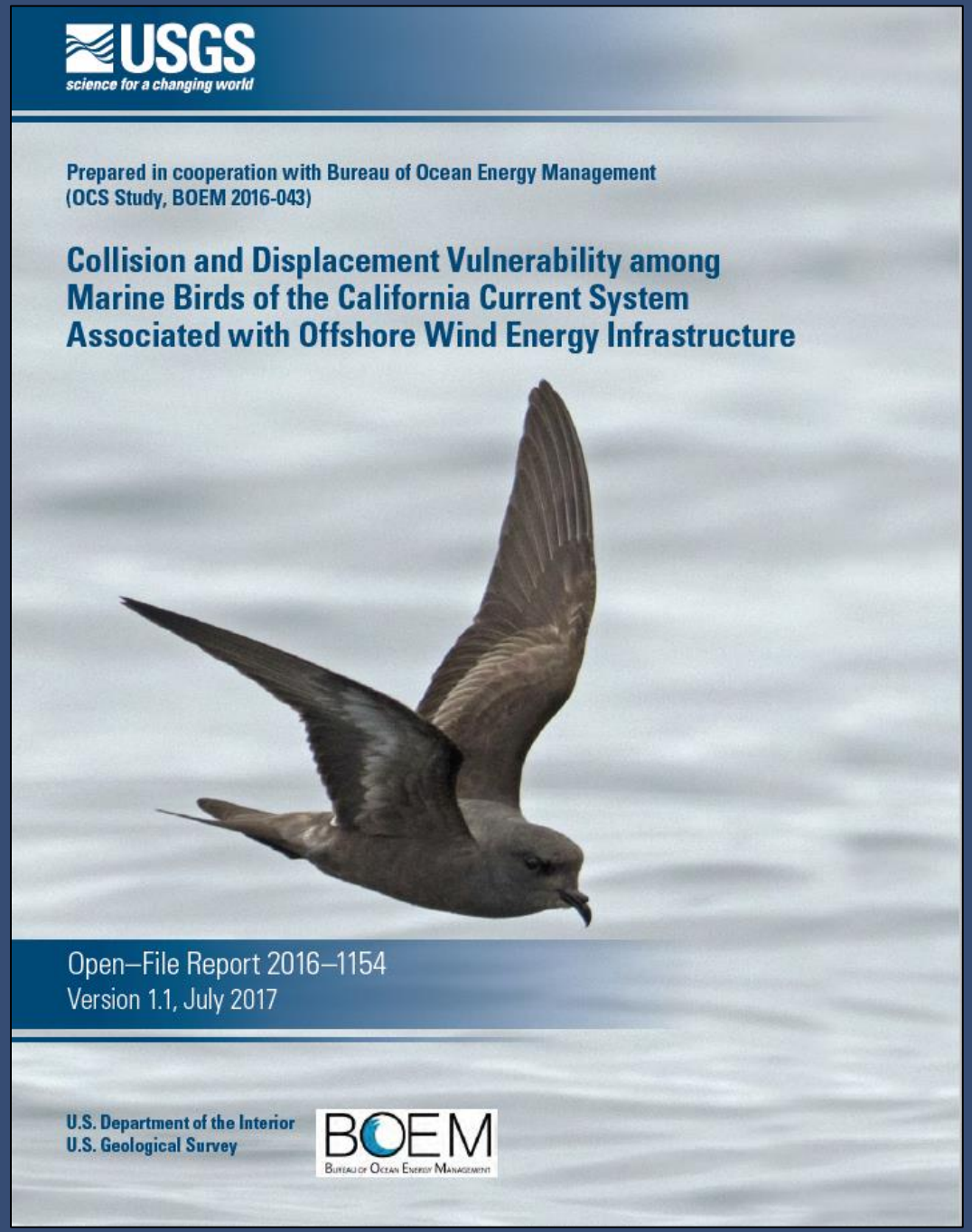
- Monitoring potential impacts is a challenge over the OCS off California.
- Boat-based monitoring represents a logistic challenge and is expensive, plus it's very difficult to detect avian collisions at sea.
- Technologies are currently being developed for remote monitoring of offshore wind sites and projects. They are in the development stage.

Avian Vulnerability to Offshore Wind has Been Modelled for the California Current

- Population Vulnerability
- Collision Vulnerability
- Population Displacement Vulnerability

Next step could be regionwide or specific-site risk modelling using

- Species distribution and abundance
- Flight height data as a function of wind speed and direction
- The "windscape" in the area under consideration



Seabird Behavioral Response to Presence of Wind Turbines

- **Risk models are a necessary first step**
- **But, we have no a priori information on how pelagic birds that fly high under high winds will respond to the presence of turbines**
  - May avoid them entirely
  - May be indifferent
  - May collide

Monitoring

- **Likely that only monitoring will provide data on pelagic bird behavioral response**
- **Monitoring in deep water quite difficult**
  - Observational monitoring
  - Monitoring instrumentation

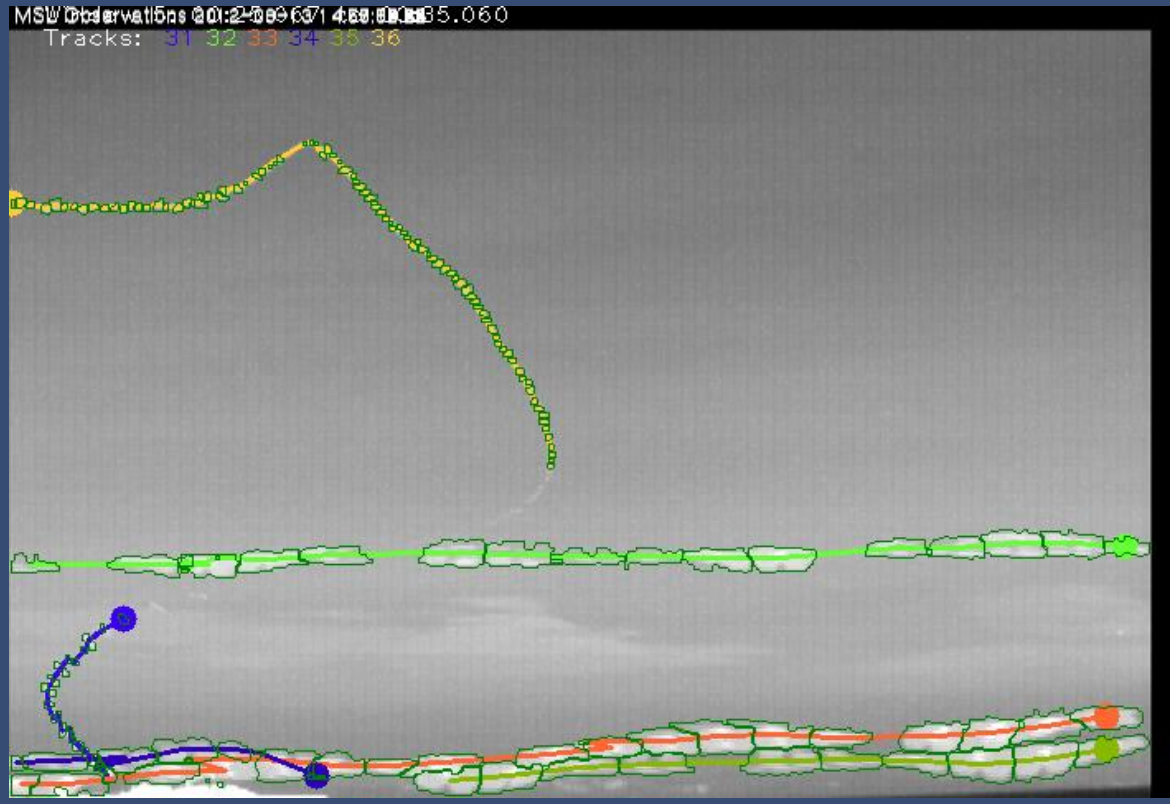
New Monitoring Instrumentation

- **Instrumentation technologies under development that show promise include**
  - Radar (horizontal and vertical)
  - Optical (visual, thermal imagery)
  - Acoustic
  - Accelerometers (vibration sensors)
- **Considerations**
  - platform stability Issues
  - Scale
  - Data streams
  - Level of detection required (e.g., species identification)

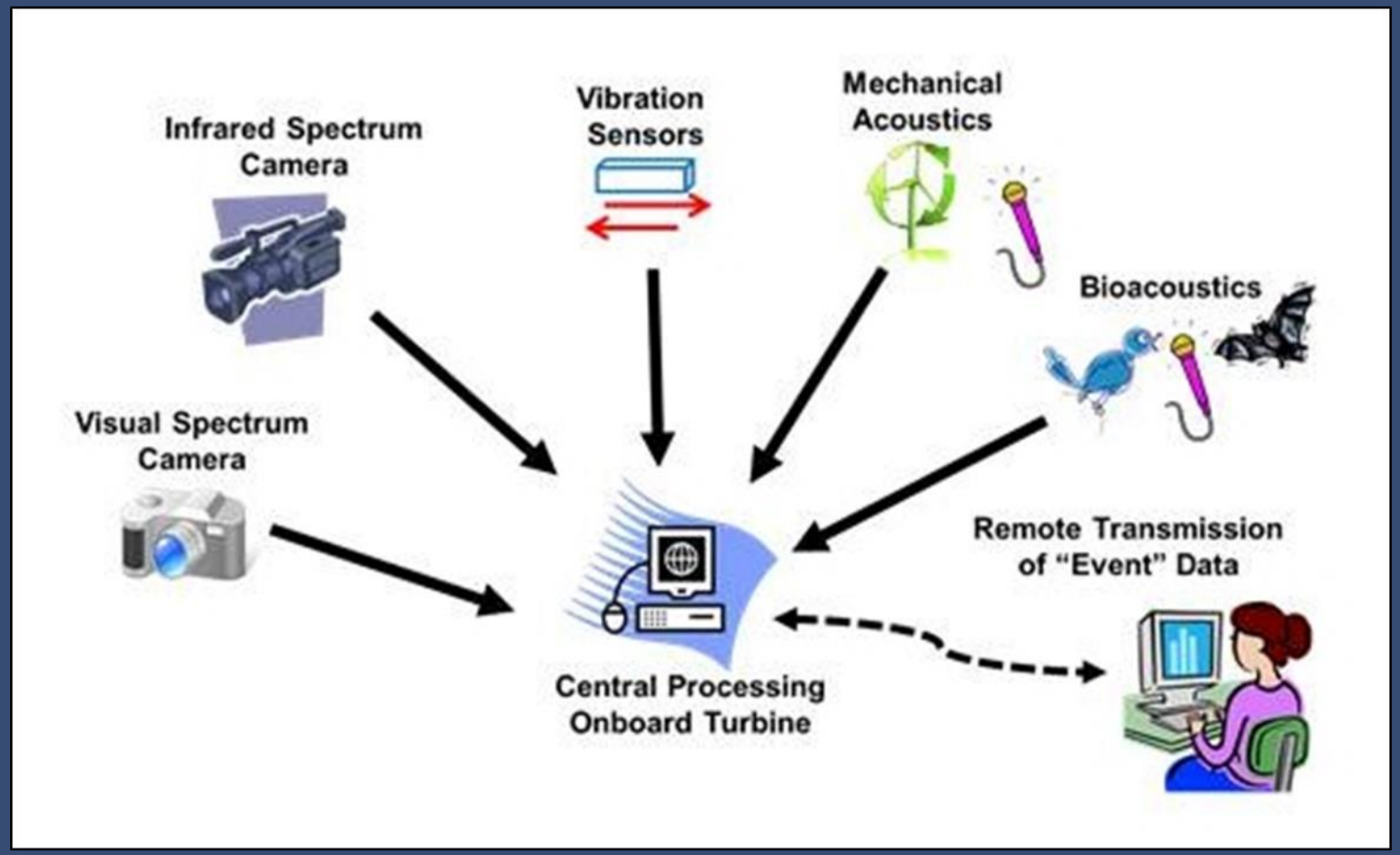
Monitoring Technologies

- **Thermal Tracker: Avian remote sensing for offshore wind**
  - Shari Matzner et al. Pacific Northwest National Laboratory
    - Thermal video enabling recording bird and bat activity both day and night and in low visibility conditions
    - Automated processing delivers quantified passage rates and features for species classification
    - Video exploits animal temperature contrast with background temperature to capture flight tracks

Pacific Northwest
NATIONAL LABORATORY



Synchronized Sensor Array for Remote Monitoring



Dr. Roberto Albertani, School of Mechanical, Industrial & Manufacturing Engineering, OSU

Dr. Robert Suryan, Hatfield Marine Science Center, OSU

Dr. Brian Polage, Northwest National Marine Renewable Energy Center, UW