CENTRO DE INVESTIGACIONES BIOLOGICAS DEL NOROESTE, S.C.

Laboratorio de Necton y Ecología de Arrecifes

EXTREME EVENTS OF COLD WATER AND HIGH LIGHT IRRADIANCE ARE RESPONSIBLE OF MASSIVE BLEACHING IN CORAL REEFS

Pedro C. González-Espinosa
David A. Paz-García
Eduardo F. Balart
Héctor Reyes-Bonilla

CORAL BLEACHING

Animal-algae relationship

Sensitive to environmental variation

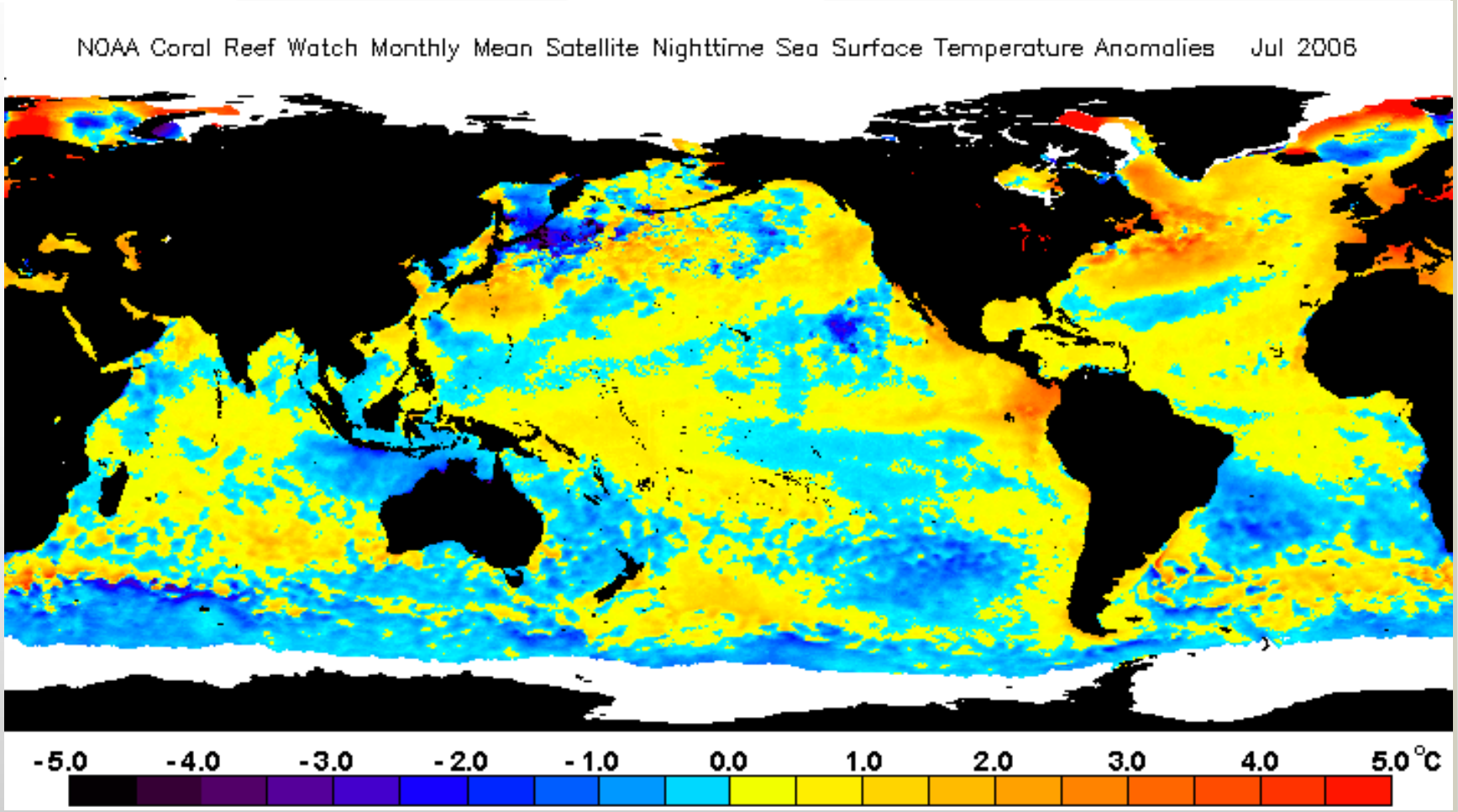
Disrruption

Expels its zooxanthellae

Linked to elevated SST

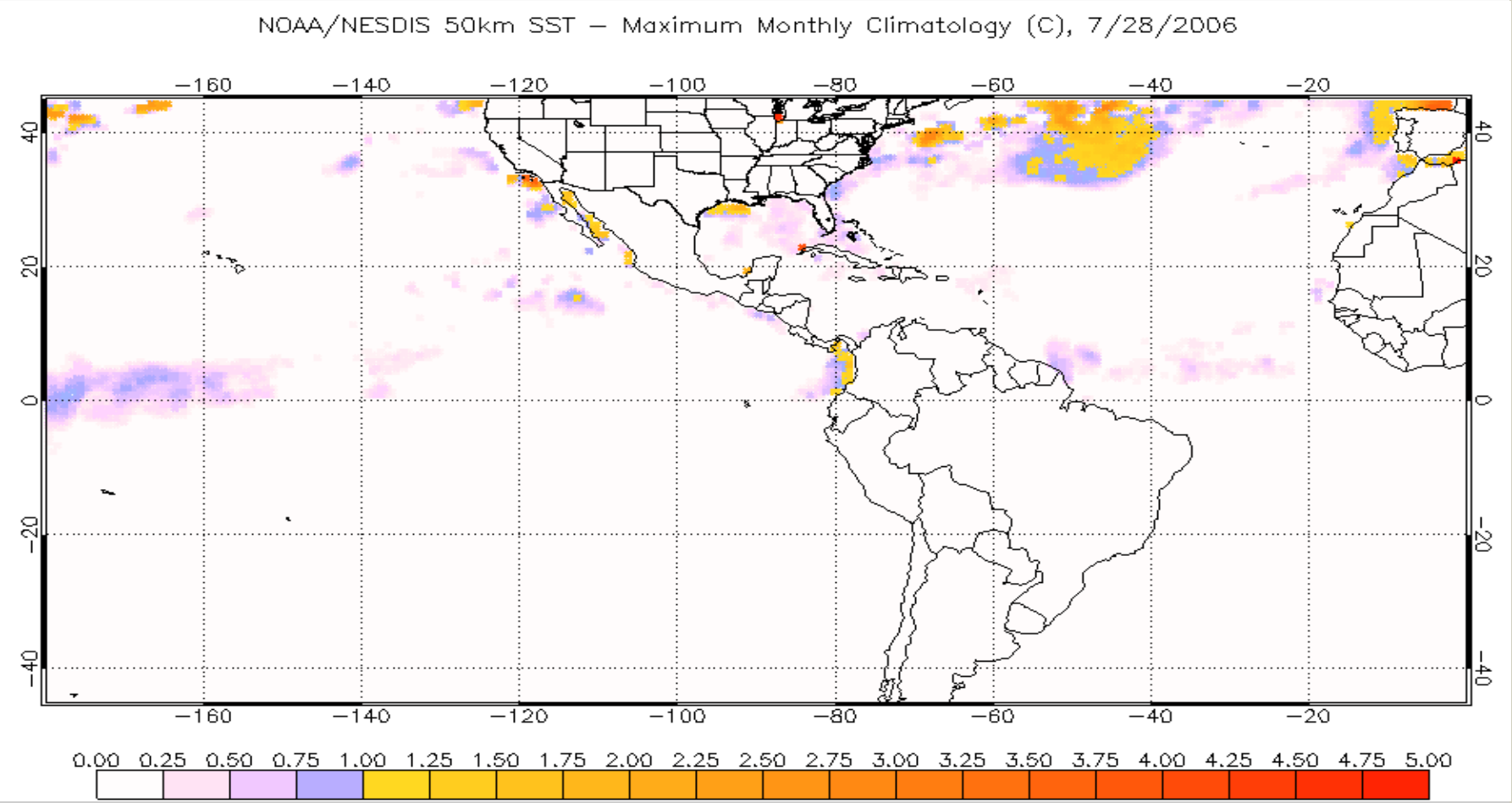
(Berkelmans and Willis 1999; Hoeg-Guldberg 2005

NOAA → Monitor → CRW → Satellite → NRT Anomalies



Goreau and Hayes (1994). Glynn and D'Croz (1990)

- “Hotspot”.
- SST is warmer than the MaxMM.
- Anomalies of 1 º enough to cause stress.



Liu et al. (2003); Liu et al. (2005); Skirving (2006)

WHAT ABOUT COLD WATER?

Spring "bleaching" among *Pocillopora* in the Sea of Cortez, Eastern Pacific

T. C. LaJeunesse · H. Reyes-Bonilla · M. E. Warner

Thermal History of Reef-Associated Environments During a Record Cold-Air Outbreak Event

N. D. Walker[1], H. H. Roberts[2], L. J. Rouse[2], Jr. and O. K. Huh[2]

Catastrophic Mortality on Inshore Reefs of the Florida Keys: Cold-Water Physiology of Three Common Reef-Building Corals

Dustin W. Kemp [1], Clint A. Oakley [2], Daniel Thornhill [3], Gregory W. Schmidt [2], William K. Fitt [1]

UGA School of Ecology The University of Georgia

Limnol. Oceanogr., 50(1), 2005, 265–271

Coral bleaching following wintry weather

Ove Hoegh-Guldberg[1] *and Maoz Fine*
Centre for Marine Studies, University of Queensland, St Lucia 4072.

EXTENSIVE BLEACHING OF THE CORAL *PORITES LOBATA* AT MALPELO ISLAND, COLOMBIA, DURING A COLD WATER EPISODE IN 2009*

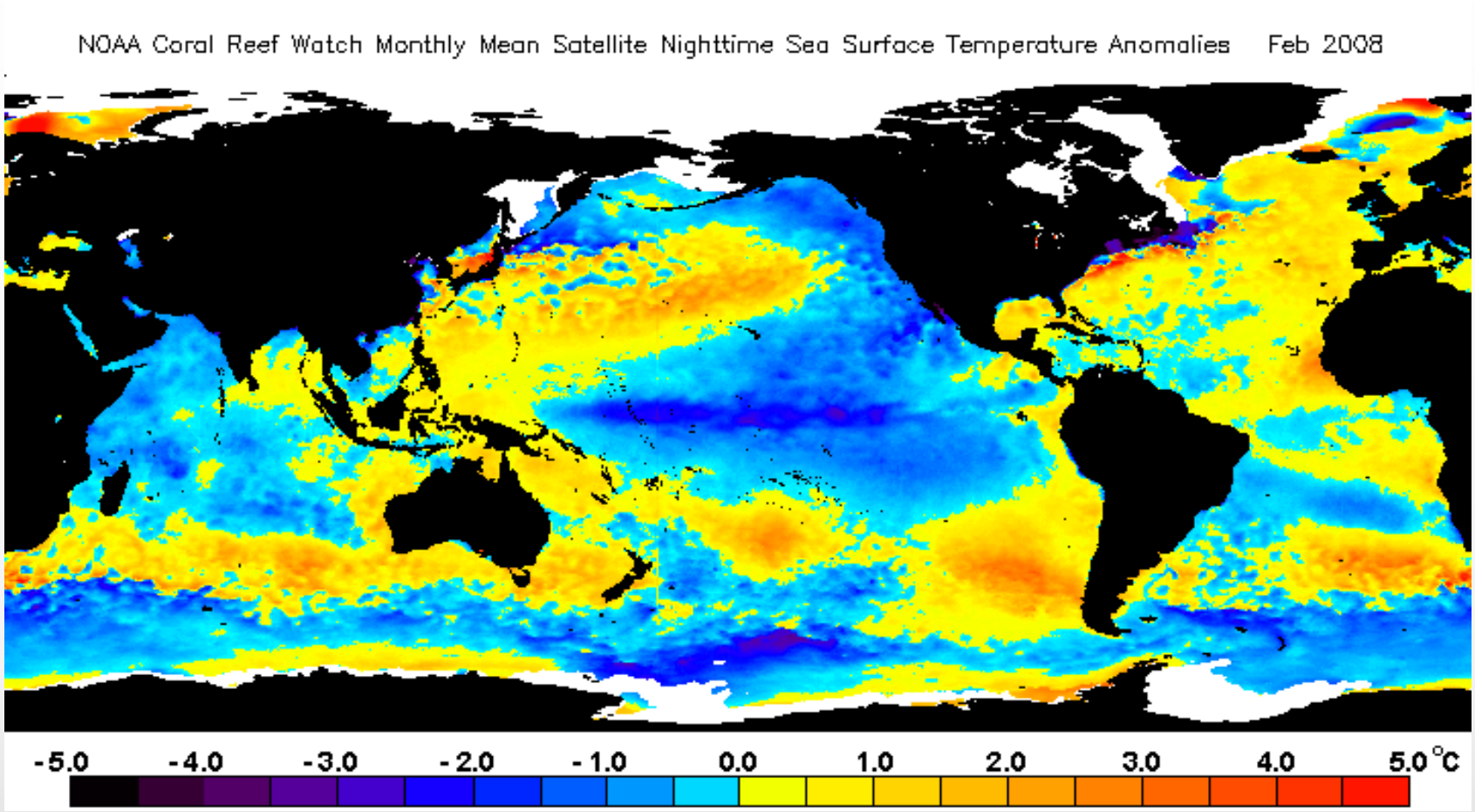
Fernando A. Zapata[1], *Juliana Jaramillo-González*[1] *and Raúl Navas-Camacho*[2]

Efecto del blanqueamiento del coral por baja temperatura en los crustáceos decápodos asociados a arrecifes del suroeste del golfo de California

Effect of coral bleaching induced by low temperature on reef-associated decapod crustaceans of the southwestern Gulf of California

Luis Hernández[1]*, Héctor Reyes-Bonilla[1] y Eduardo F. Balart[2]

GATHER COLD ANOMALIES



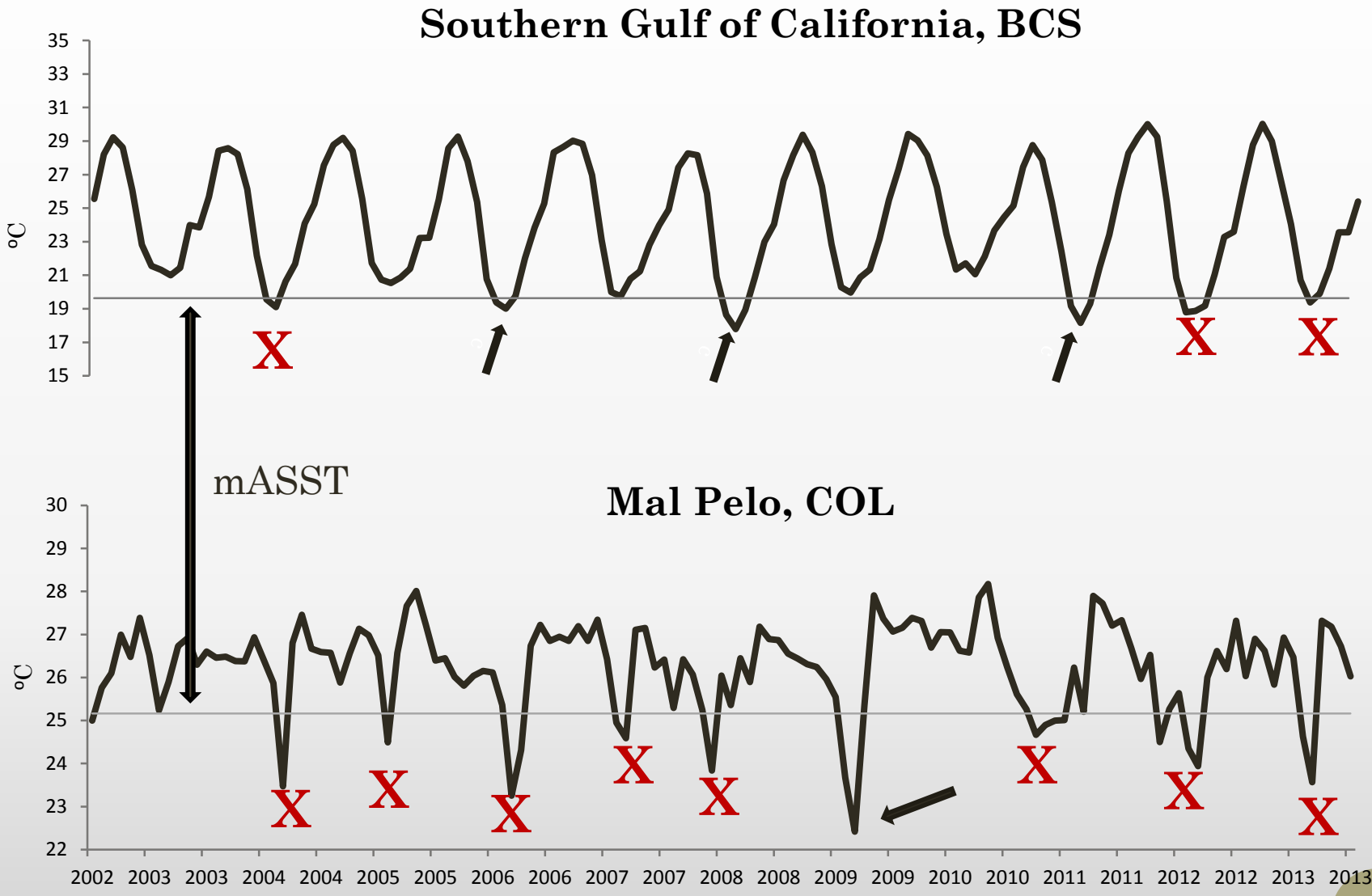
"COLD SPOTS" SST is lower than the mASST

NO methodology low thermal stress.

HOW LOW IS TOO LOW?

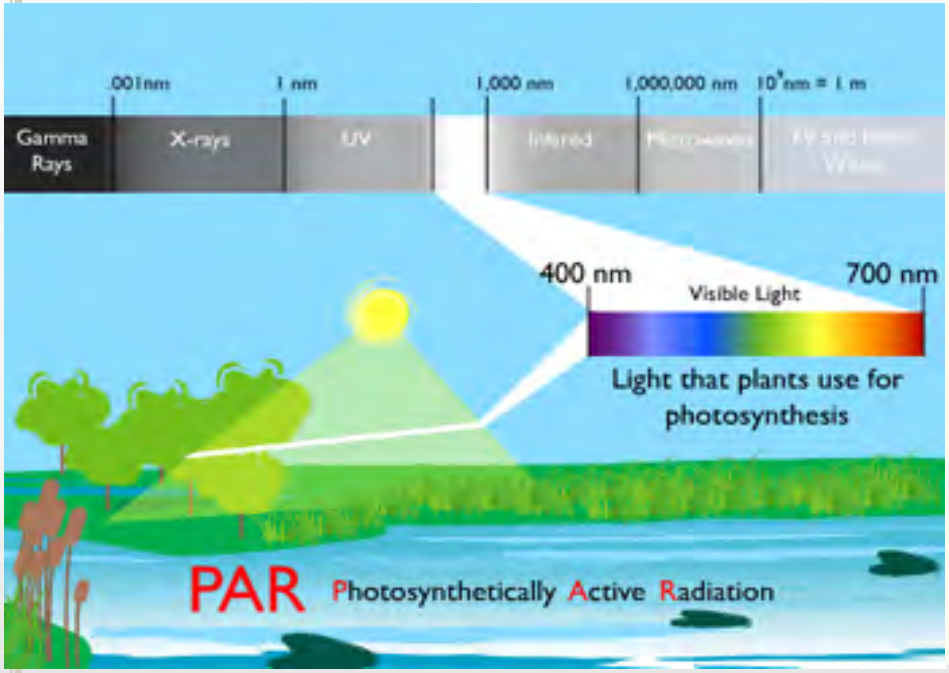
-1° as occurred with warm temperatures

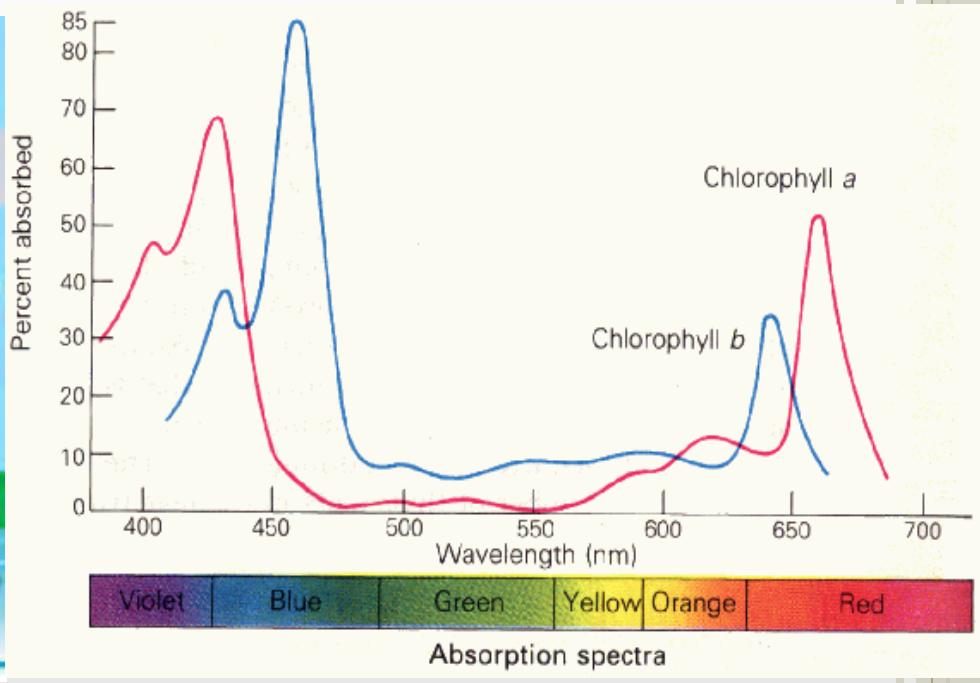
Exploratory attempts of ours



Paz-García *et al.* (2012); Zapata *et al* (2011); Hernandez *et al.* (2010); LaJeunesse *et al.* 2007.

Overestimate → Other factors → Light → PAR

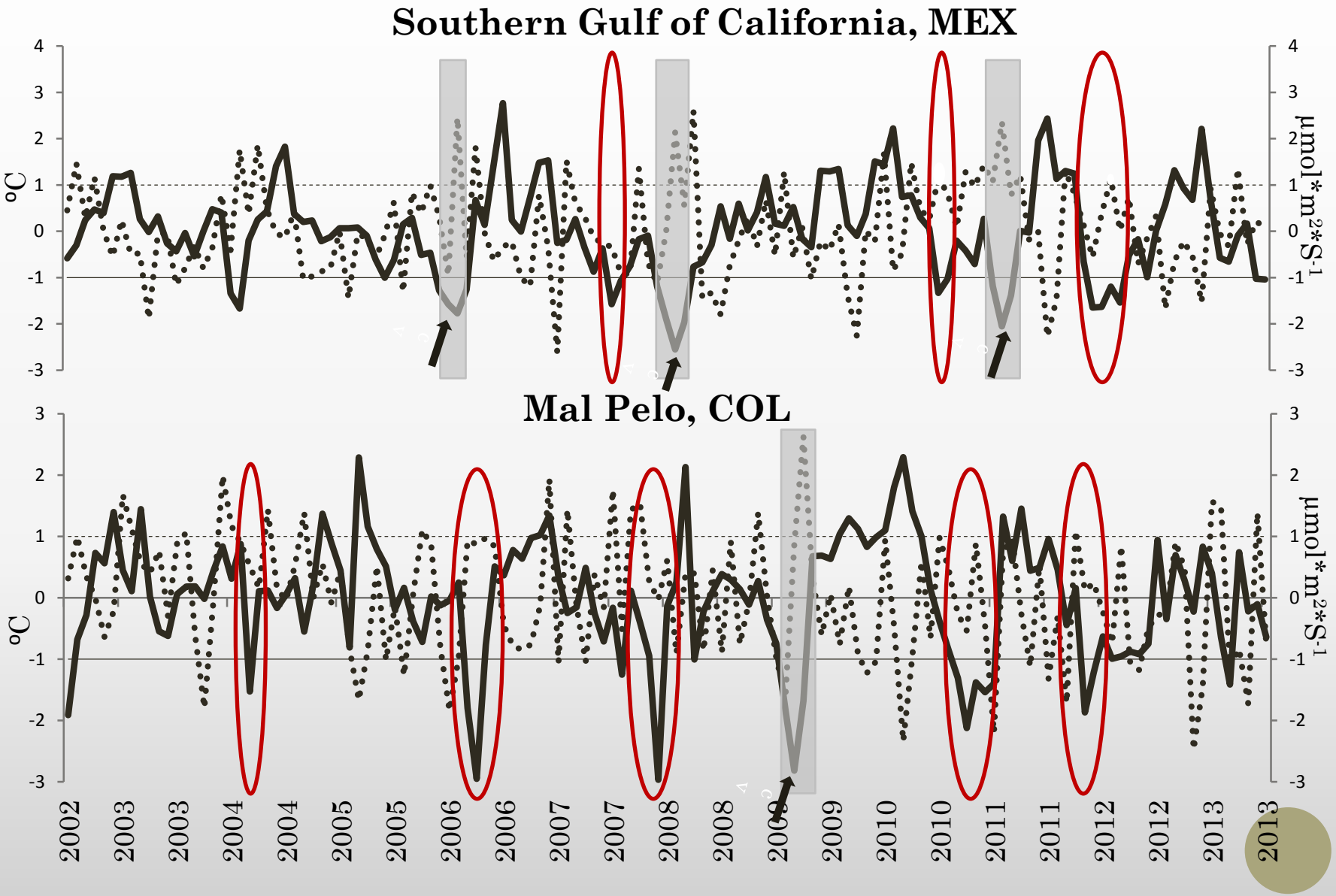


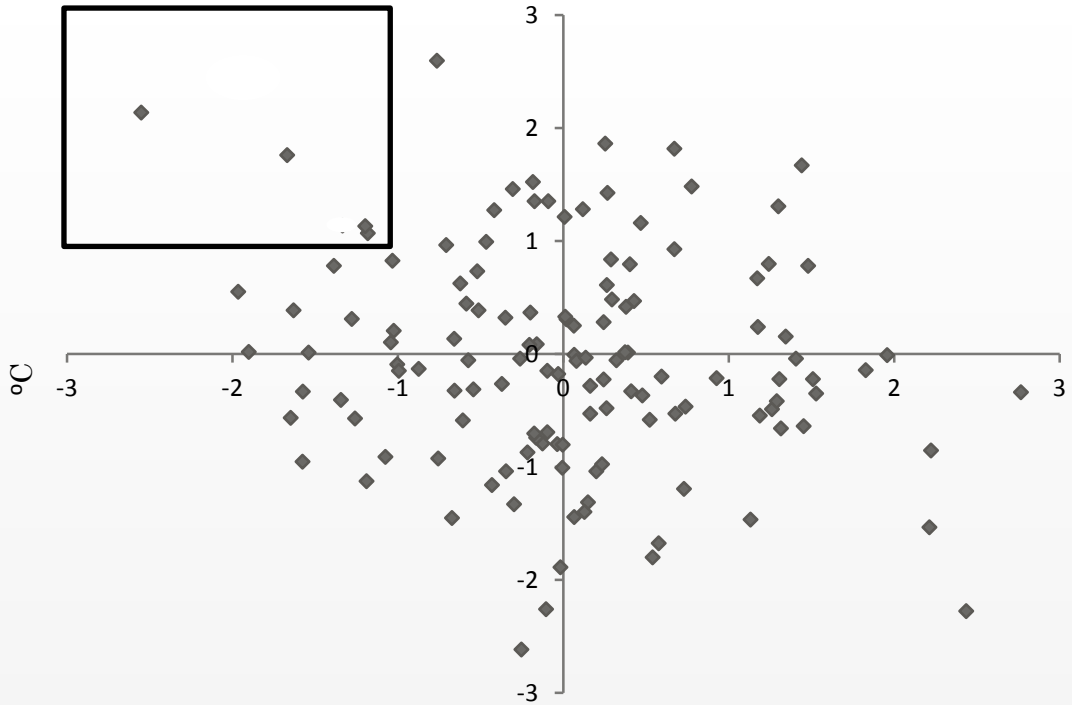


Excess or deficit → Light anomalies → Stress

Iglesias Prieto *et al.* 1992. GIOVANNI application

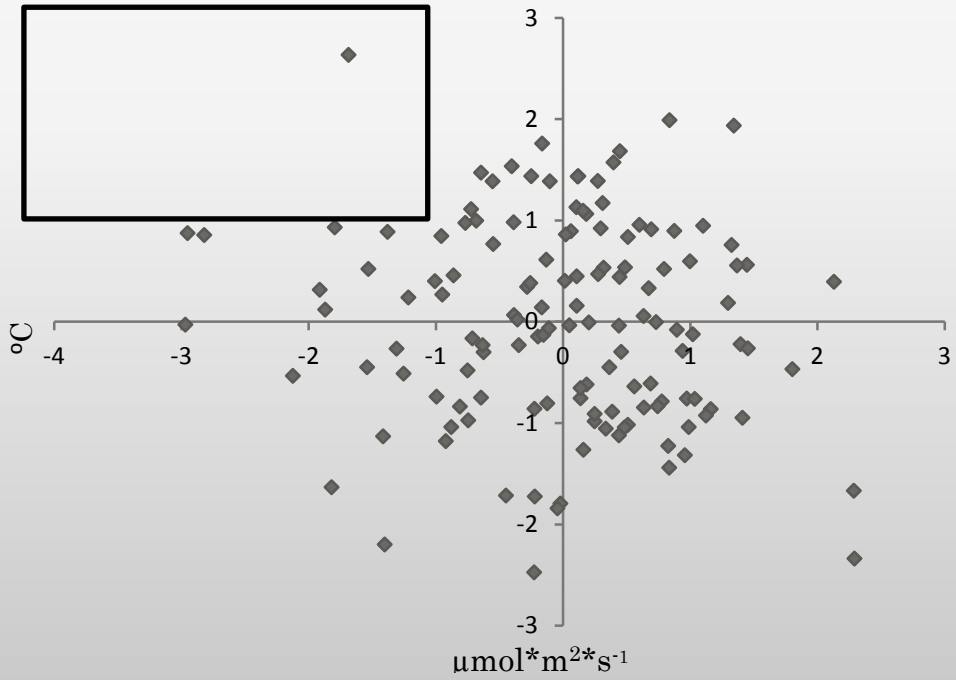
Our proposal: photo-thermal stress



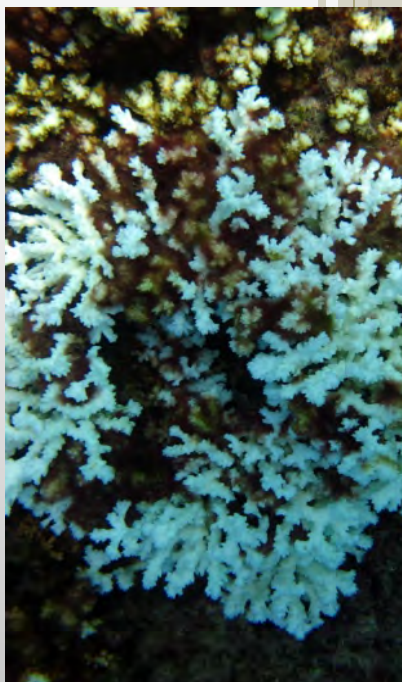


SGC, MEX

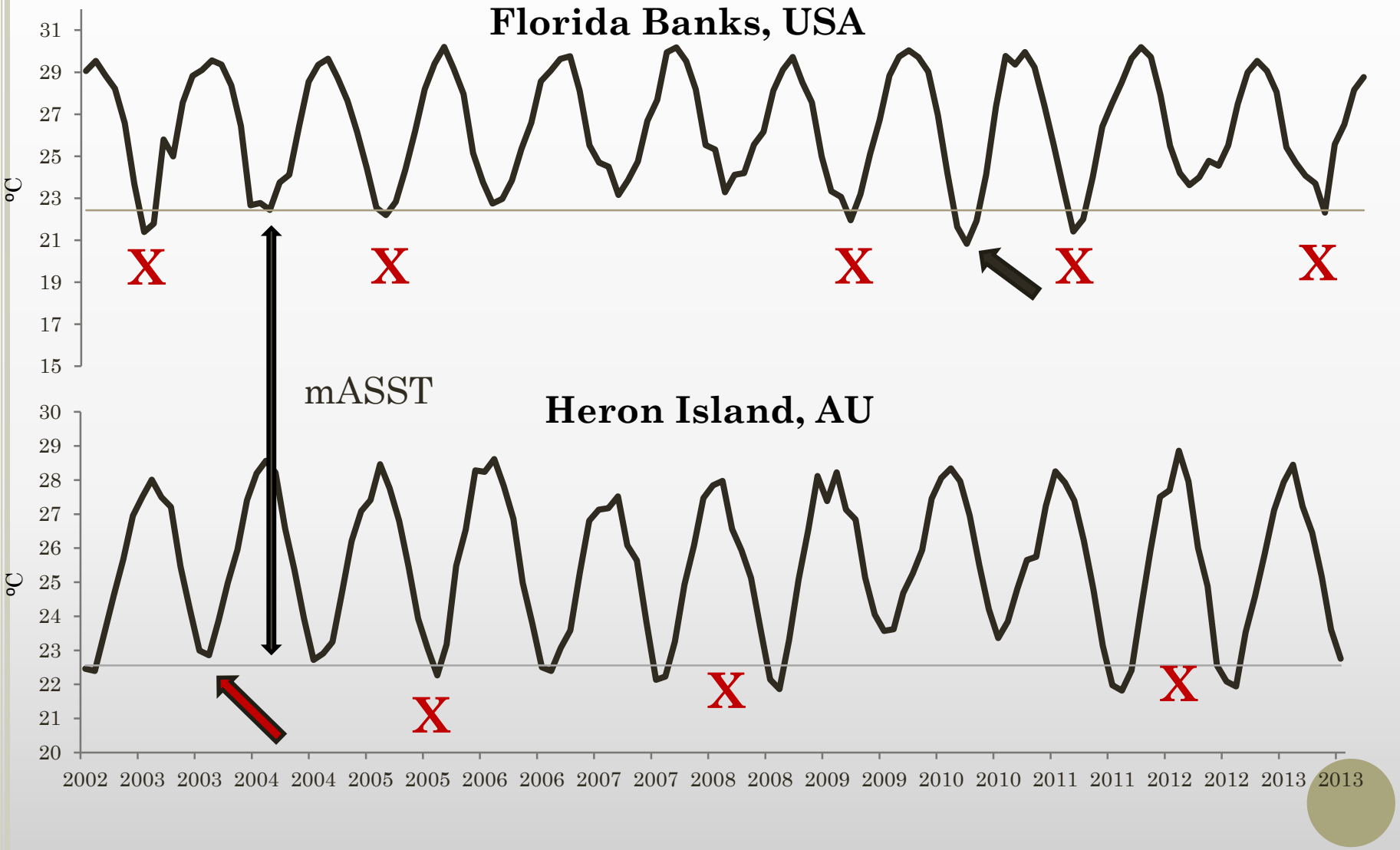
Correspondence among low temperature and high irradiance.



Mal Pelo, COL

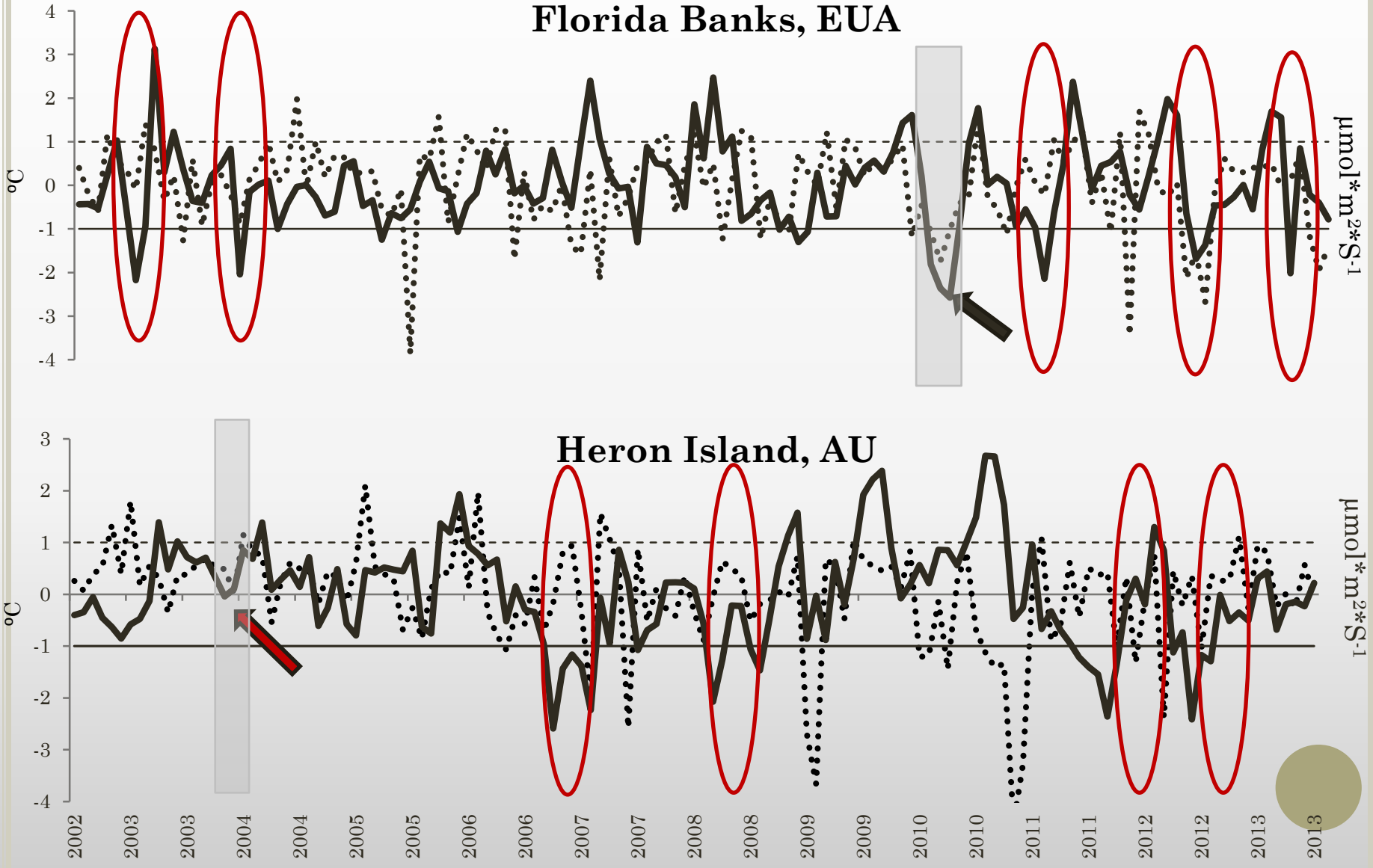


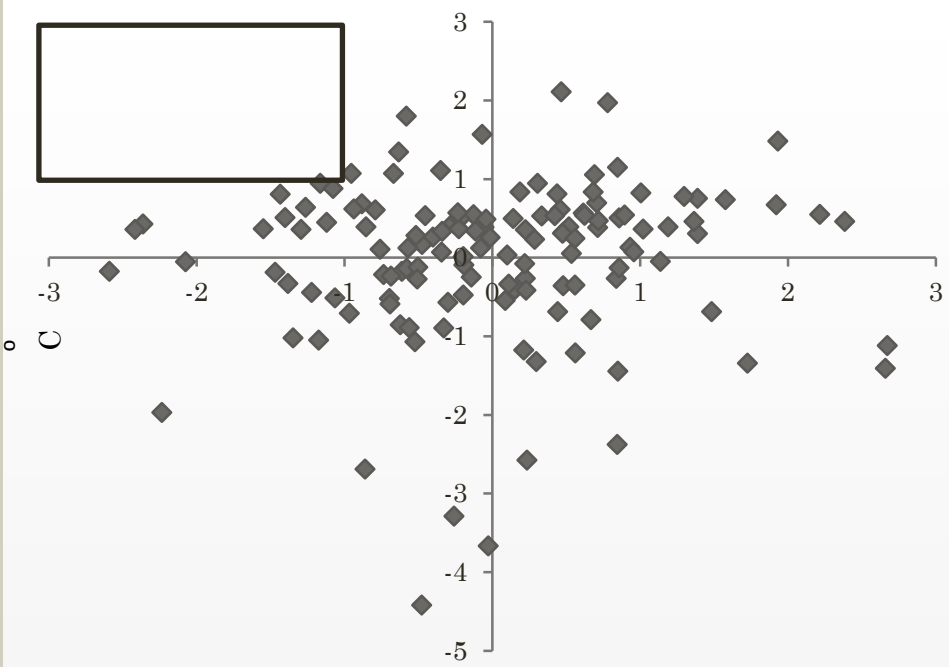
Other cases of study "thermal stress"



Hoeg-Guldberg *et al.* (2005); Colella *et al.* (2012)

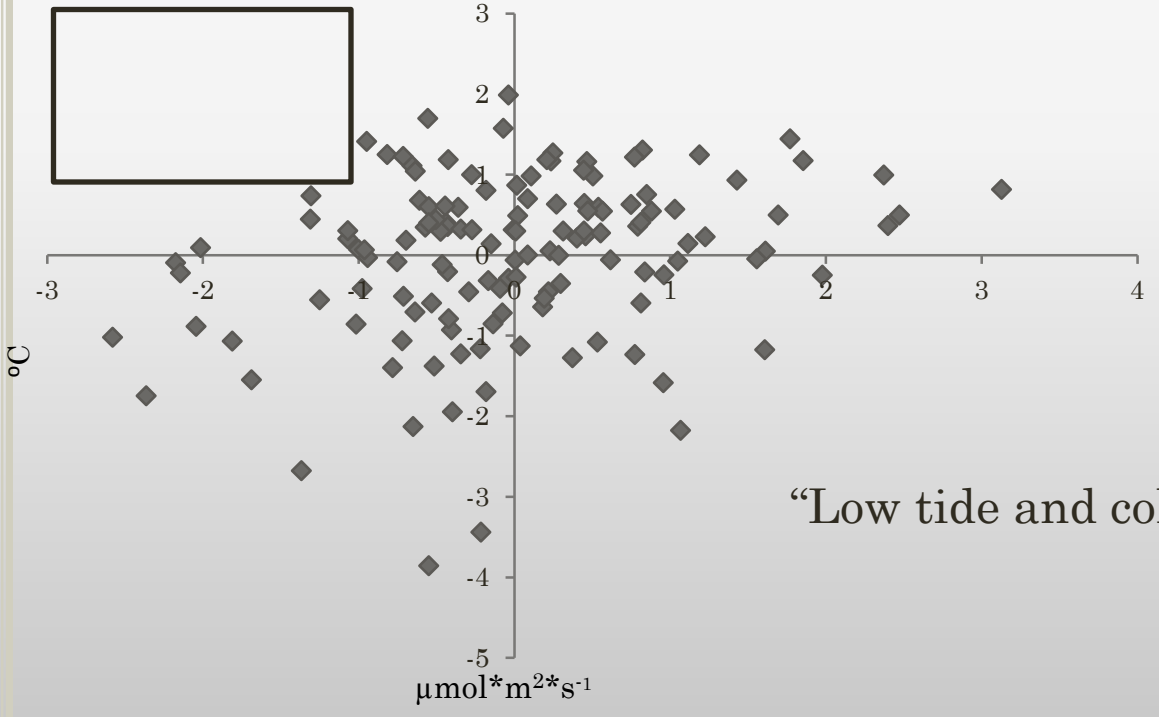
COMBINING PHOTO-THERMAL STRESS





Florida Banks, EUA

"Cold air outbreak"



Heron Island, AU

"Low tide and cold air exposure 2 days"

Conclusion

- Our approach there is not only a thermal threshold but also a **thermal-lighting threshold**.

- The conjunction of -1º of temperature and 1º of irradiance would be the threshold for cold-water coral bleaching.

ACKNOWLEDGMENTS

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CABO PULMO
PARQUE NACIONAL
Thank you!
Obrigado
¡Muchas gracias!
O. Aburto