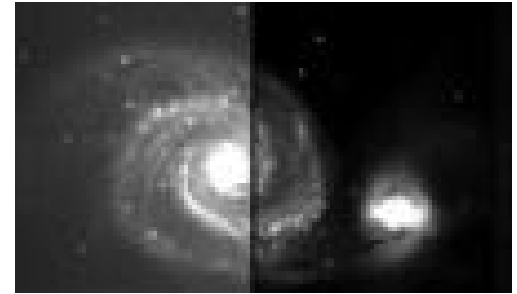


Locating and
Observing
Optical
Counterparts to
Unmodeled
Pulses in Gravitational Waves



Finding Optical Transients with LIGO and
Virgo Data

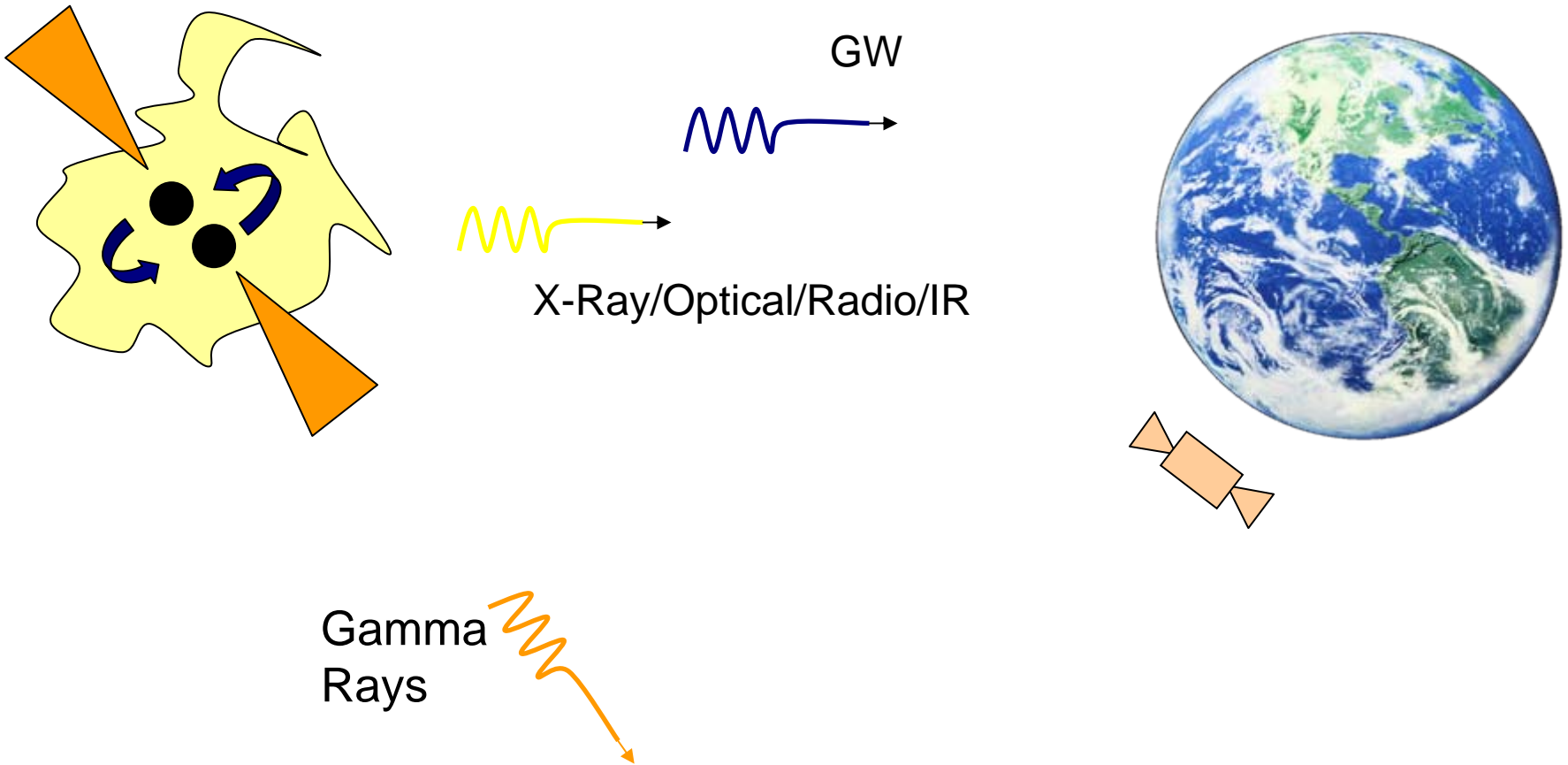
Jonah Kanner University of Maryland

Introduction to LOOC UP

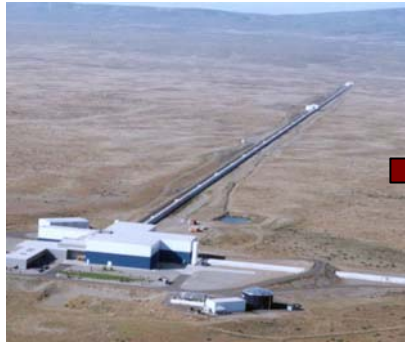
- GW Bursts are associated with cosmic violence
- Likely emission in EM as well as GW spectrum
- Analyze GW data in real time
- Actively seek EM counterparts to candidate GW events
- S6/VSR2 Starts in 2009!

Orphan Afterglow Model

SH GRB



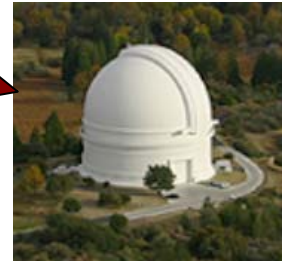
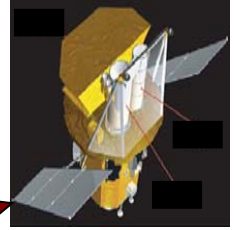
Global IFO Network (LIGO/Virgo)



Identification
Verification
Reconstruction

Scheduling

Global Telescope Network (TBA)



Images of Virgo, LIGO, ROTSE, SWIFT, and Palomar Transient Factory

Interesting Challenges

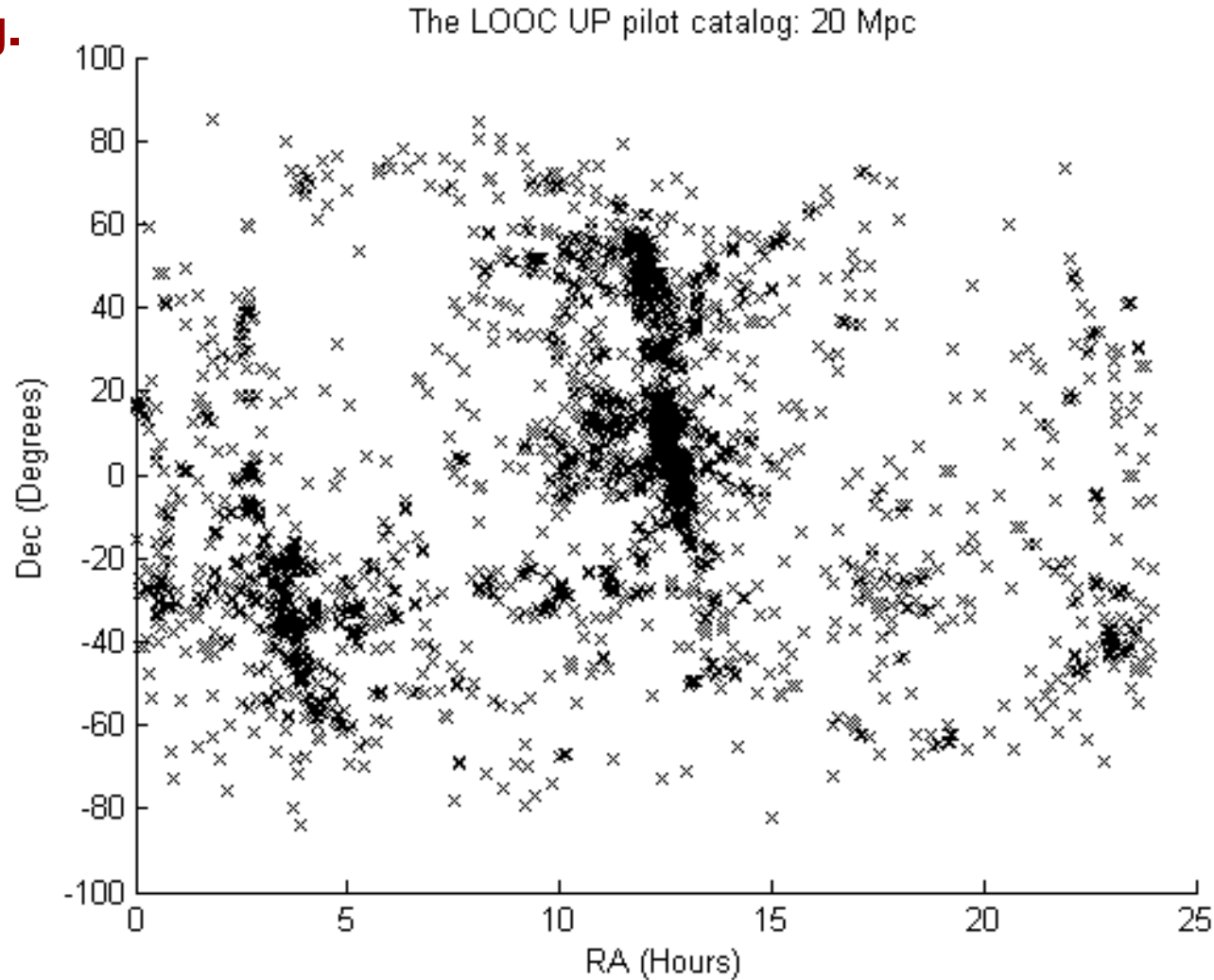
- Online Analysis
 - Months to minutes, data transfer, vetoes
- Position Reconstruction
 - Timing, Penalty factors, “Bayesian”, Gal. Catalog
- Network Definition
 - Coverage in angle, depth, and frequency
- Scheduling
 - SNR, location, time, weather, past → when & where
- Image Processing/Data Analysis
 - How to spot a transient, How to set ULs and FARs

Pilot Study

**LIGO S5 DNS Pos-avg.
range ~15 Mpc**

Catalog:

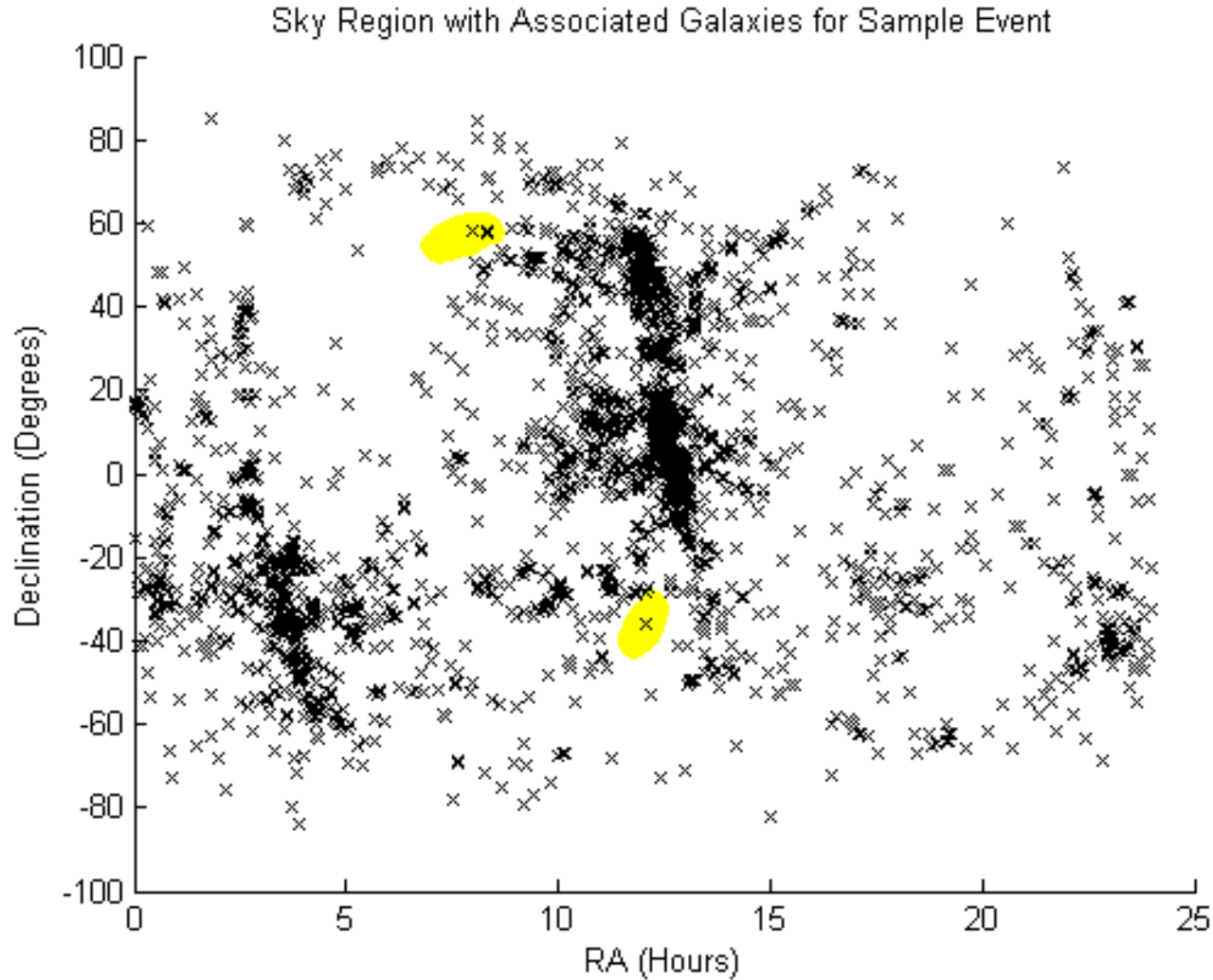
- Globular clusters & galaxies
- 20 Mpc cut-off
- Modified version of CBC catalog
- 2766 Objects



Pilot Study

For each candidate event, we seek galaxies within the **error box** of the estimated source location.

These galaxies are then imaged for transients.



LOOC UP

Columbia Univ

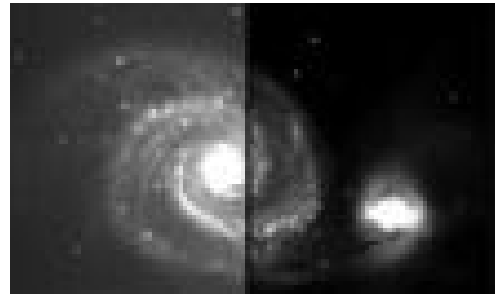
Szabolcs Marka,
Jennifer Piscionere

Univ. of Maryland

Jonah Kanner,
Peter Shawhan,
Tracy Huard

Carnegie Instit. of Washington

David Murphy



Thank you !!

<https://geco.phys.columbia.edu/projects/loocup>