

Measuring the Cosmic Optical Background

DECam Community Workshop

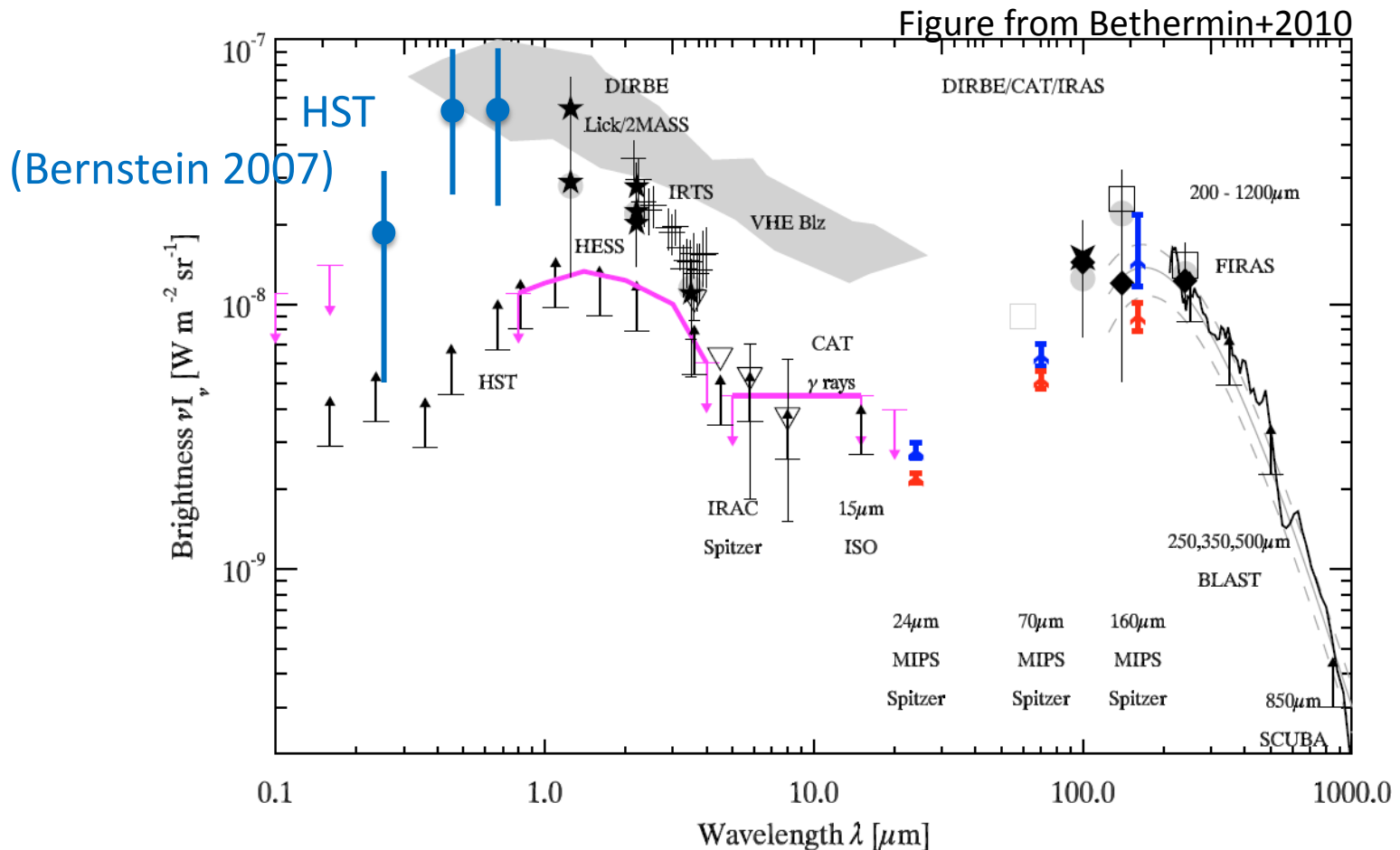
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Cosmic Optical Background (COB)

- COB = the diffuse (unresolved) radiation coming from outside the Galaxy and observed in optical wave bands.



Foreground Emission

- The major difficulty in observing the COB is strong foreground emission.
 - **terrestrial airglow**: atmospheric emission $\underline{>1,000 I_{\text{COB}}}$
 - **zodiacal light**: scattered sunlight by interplanetary dust
 $\underline{>100 I_{\text{COB}}}$
 - **Galactic stars**: can be resolved by deep imaging
 $\underline{>30 I_{\text{COB}}}$
 - **Diffuse Galactic light**: scattered starlight by interstellar dust
 $\underline{>1 I_{\text{COB}}}$

Current Observations

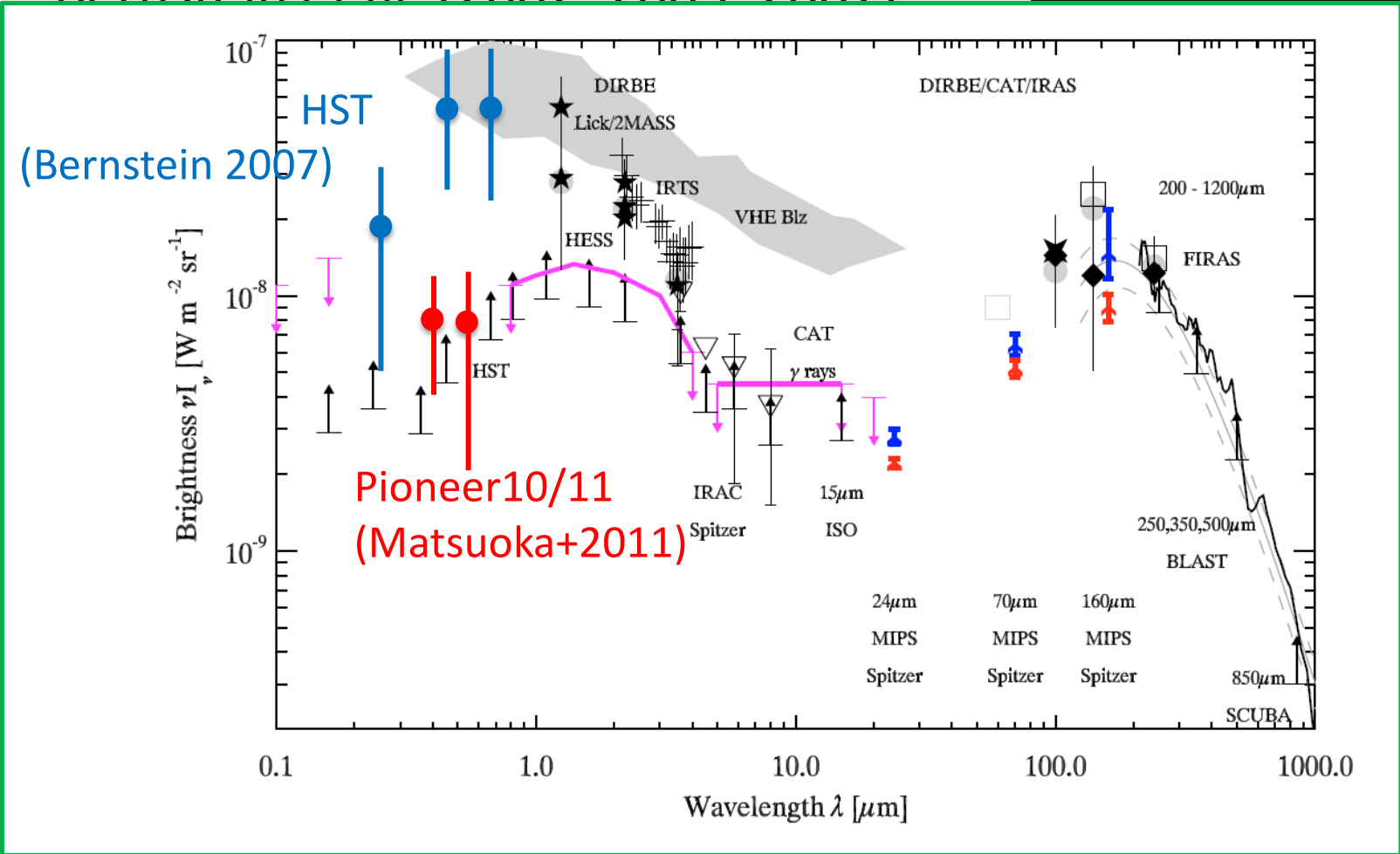
- Bernstein et al. (2002, 2005, 2007)
 - Blank-field observation with the HST/WFPC2
 - Free from the **terrestrial airglow**, but have a difficulty in the **zodiacal light** subtraction

- Matsuoka et al. (2011)
 - Re-analysis of the Pioneer 10/11 data
 - Observation at the heliocentric distances > 3.3 AU (i.e., outside the **zodiacal light** clouds)



Current Observations

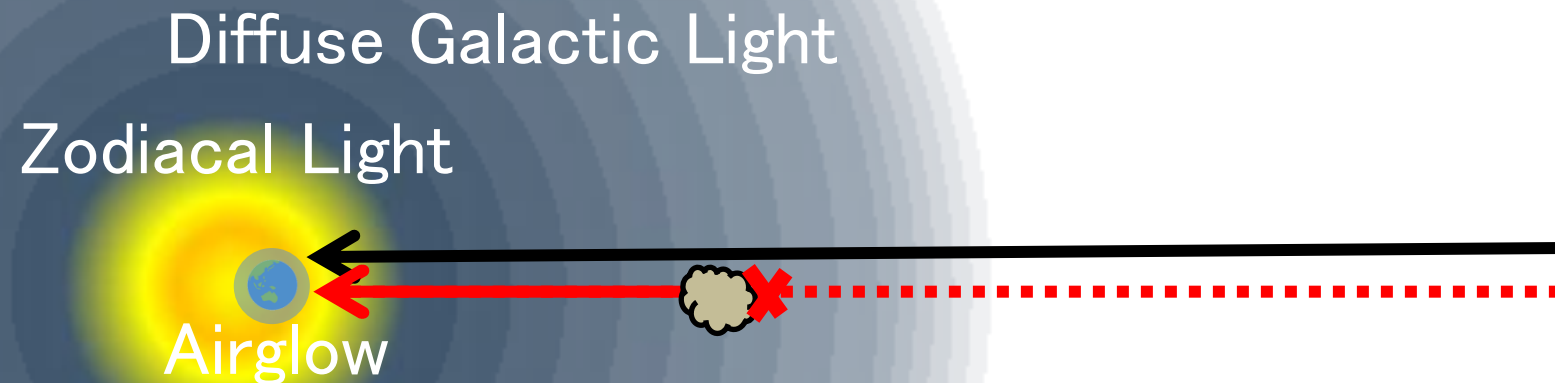
- Bernstein et al (2002 2005 2007)



Another approach

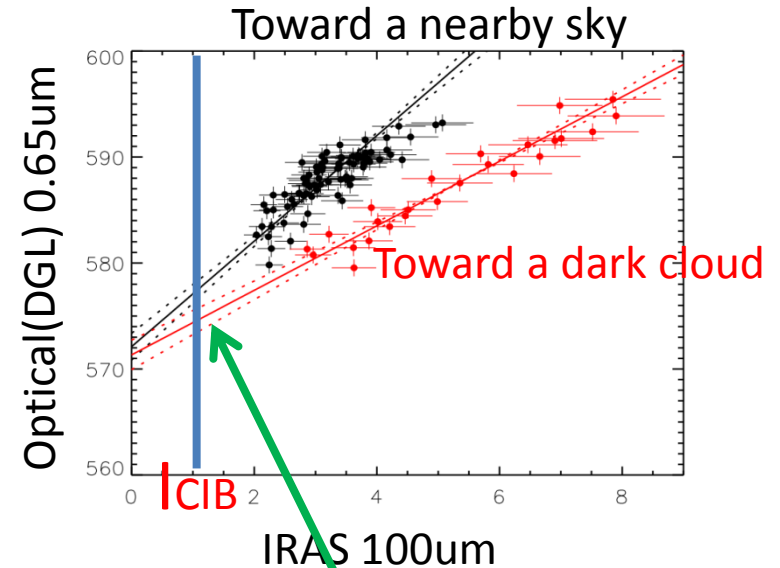
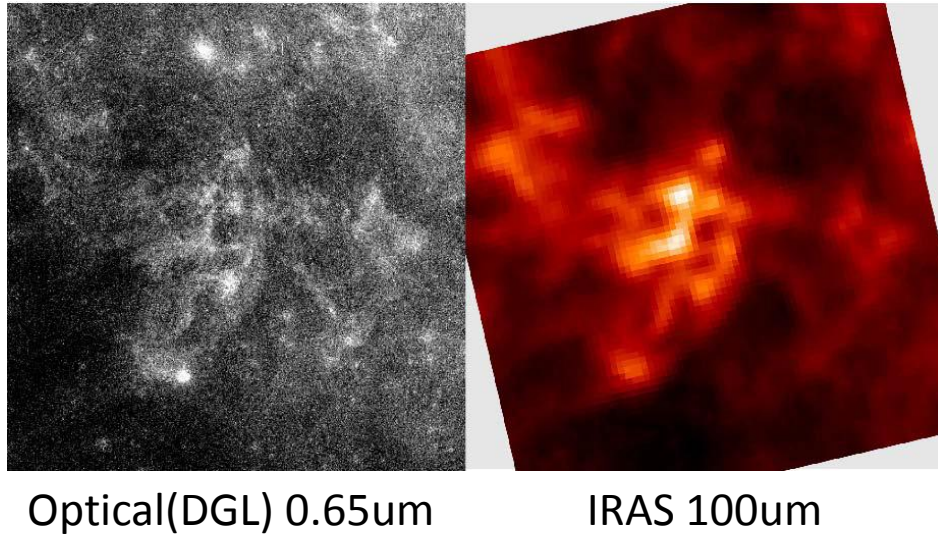
- **Dark cloud method** (proposed by Mattila 1976)
 - Comparing the brightness measured at two lines of sight

We can remove **the airglow** and **the zodiacal light** by this method. However, **Diffuse Galactic Light (DGL)** cannot be removed.



How to remove the DGL

- We use a correlation between the DGL and Far-IR emission

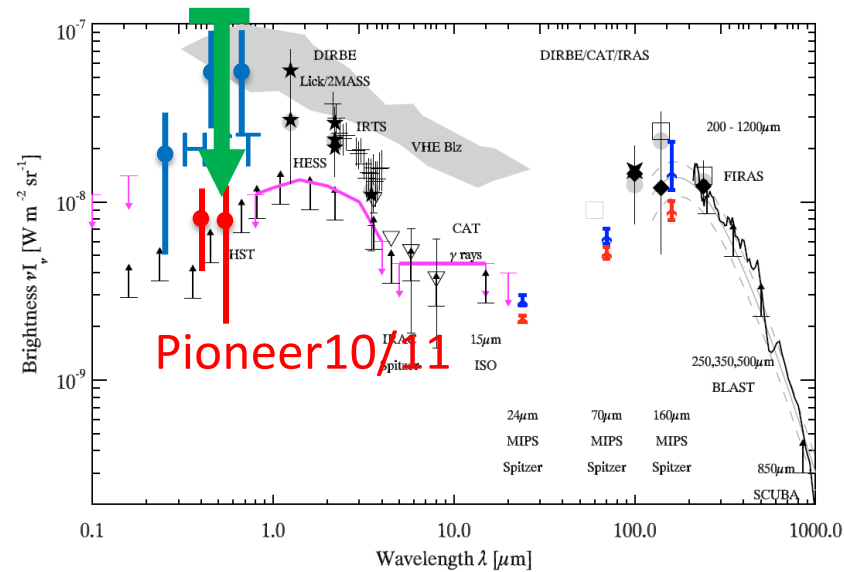


$$\begin{aligned} I_{\text{diffuse}} &= I_{\text{DGL}} + I_{\text{COB}} \\ &= a_{\text{DGL}} (I_{100\text{um}} - I_{\text{CIB}}) + I_{\text{COB}} \end{aligned}$$

The gap between two intersection correspond to the COB brightness

Result

- Result from our observation (2 deg², limiting mag ~ 19mag)
only an upper limit was obtained



To improve the accuracy of the measurement, we have to observe a **wide area (increase independent data points)** with sufficient deepness (>20mag, for Galactic star subtraction) at high Galactic latitude (less DGL).

→ **DECam's data could be useful for our study !**