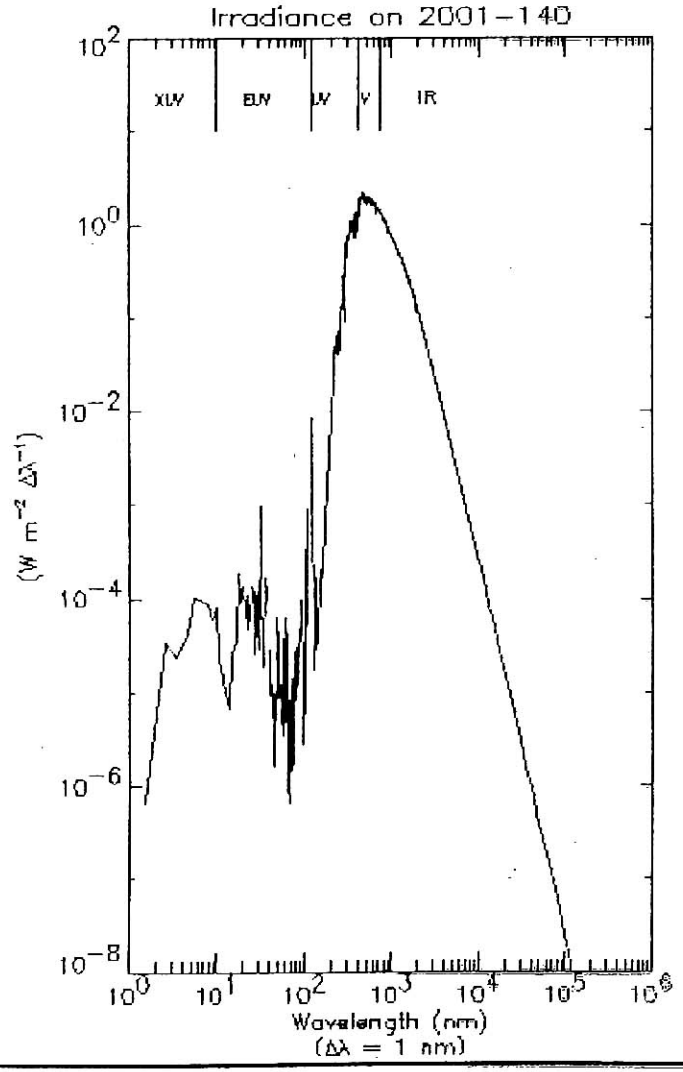
Selection of a Solar Spectrum for GLI



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Selection of a Solar Spectrum for GLI

1. Introduction

   objective, problem, requirements

2. Short overview on solar spectra

   experiments, synthetic data, future experiments

3. Conclusion

Introduction (1)

1. Objective: selecting a solar spectrum which is appropriate for the GLI mission

2. GLI is the first earth observation sensor covering such a large spectral range (UV-IR)

3. Earth observation sensors require one of the highest radiometr. calibration accuracy (e.g.: ocean colour appl.)

4. Discrepancies of the solar irradiance spectra due to errors in the calibration / changes of the solar irradiance

Introduction (2)

Mission	Launch	Applied Solar Spectrum	Spectral range of solar spectrum	Reference
MOS-IRS	1996 Mar	Neckel & Labs 1984	400–1250nm	Suemnich-1998
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GLI	2002 Feb	??		

The selection criteria:

- **appropriate spectral coverage and resolution**

  UV–VIS–SWIR (350–2500nm),

  $\Delta\lambda$ = 1nm in UV–VIS, coarser in SWIR

- **smallest total error**

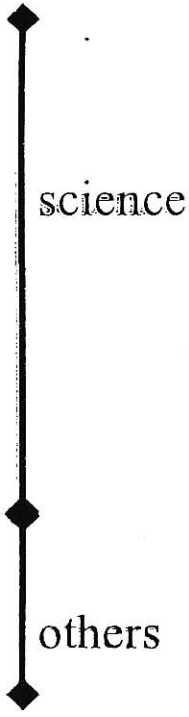
  EO sensors required the highest rad. calibration accuracy

- **future updates/improvement of the data**

  changes in the UV, reduction of the remaining error

- **but: operational request**

  only one spectrum for the complete mission



Short overview on solar spectra

1. Measurements (experiments only covering a small spectral region)

   - Neckel & Labs 1962 - 1984
   - Thuillier 1998, 2000, 2001
   - ...

2. Synthetic data (combination of data from various experiments, with assumptions and scaling)

   - World Radiation Center: Wehrli-1985 (including Brasseur & Simon, Arvesen, Neckel &Labs, Smith&Gottlieb data)
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3. Future promising plans:

- SOLSPEC (Thuillier) on International Space Station (ISS)

  retrieval mission planned for **2003/2004**

  λ= 200 - 2500 nm

- TSIM (SORCE): Total Solar Irradiance Mission (Satellite)

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  5 years expected mission time

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- SOLAR-2000; a new model

  new model combing the data of various experiments (e.g. SOHO)

  daily update of irradiance data (now: UV only; VIS will be included in 2004)

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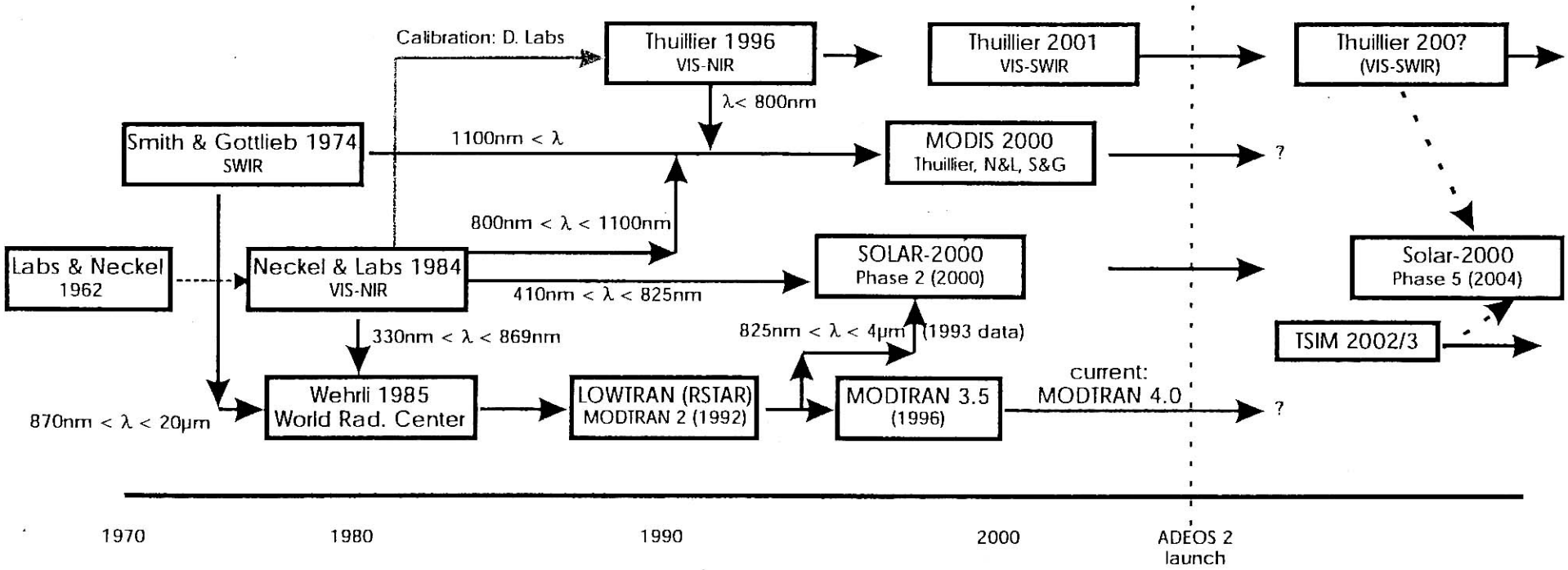
Overview of commonly used solar spectra (VIS-SWIR)



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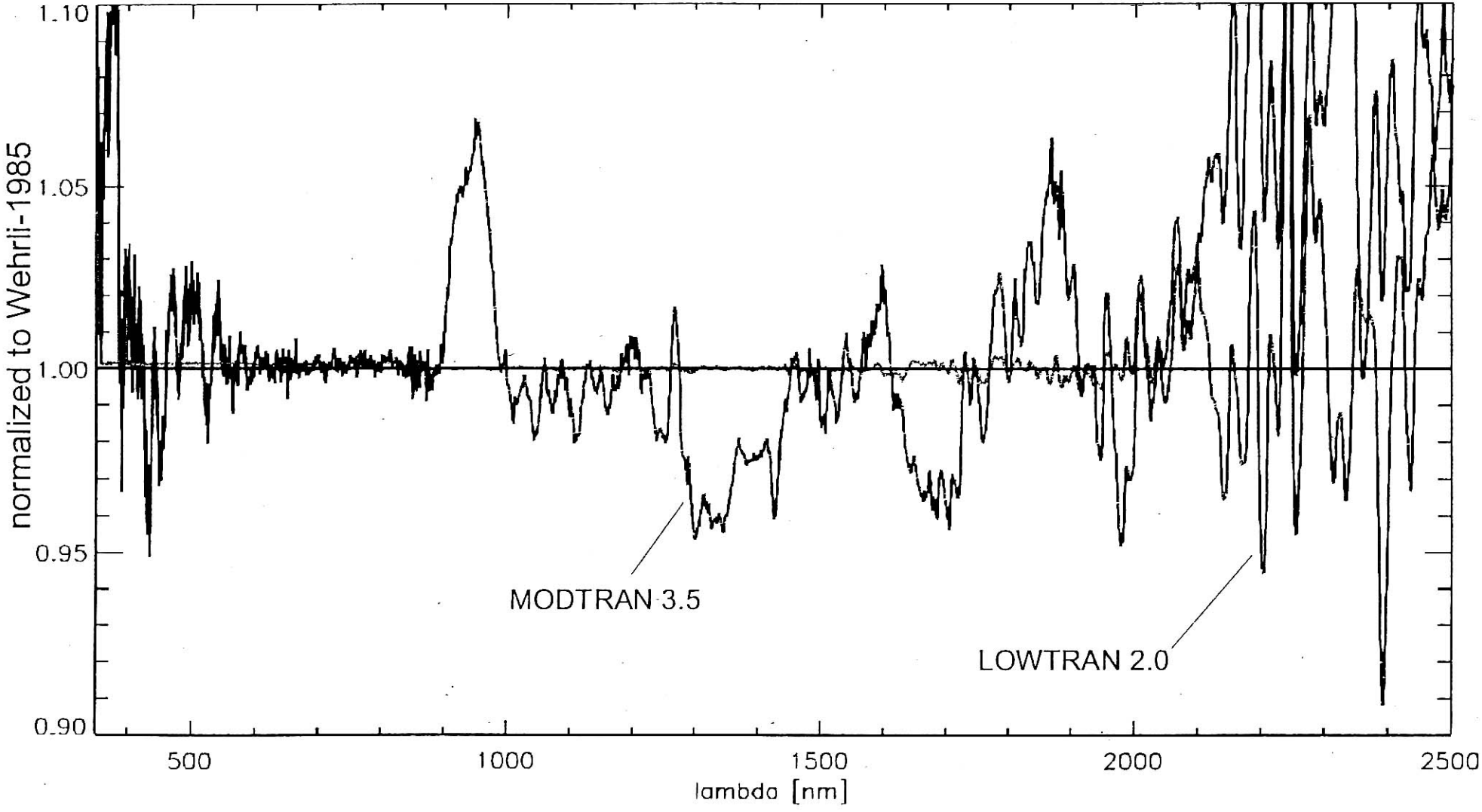

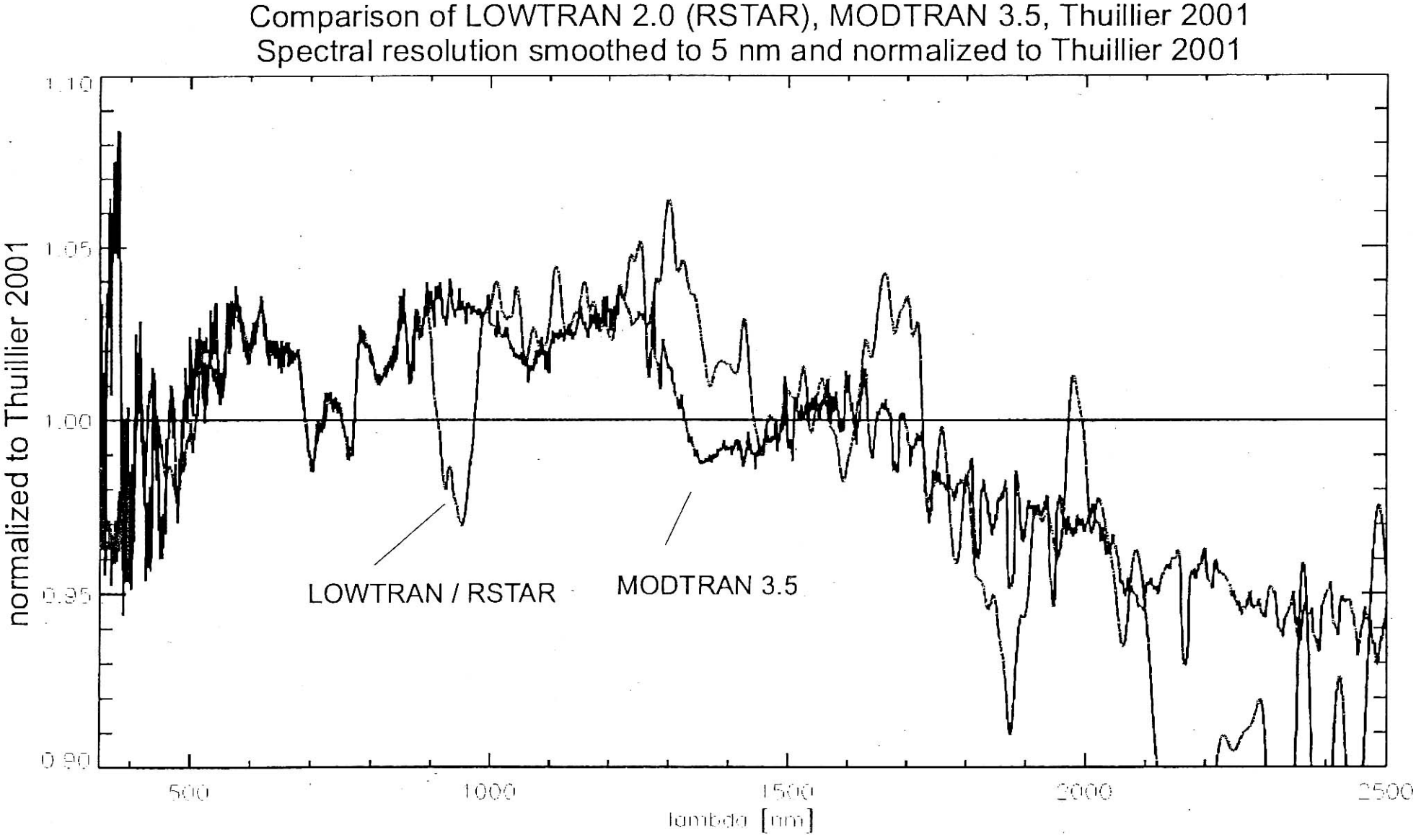
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lambda [nm]
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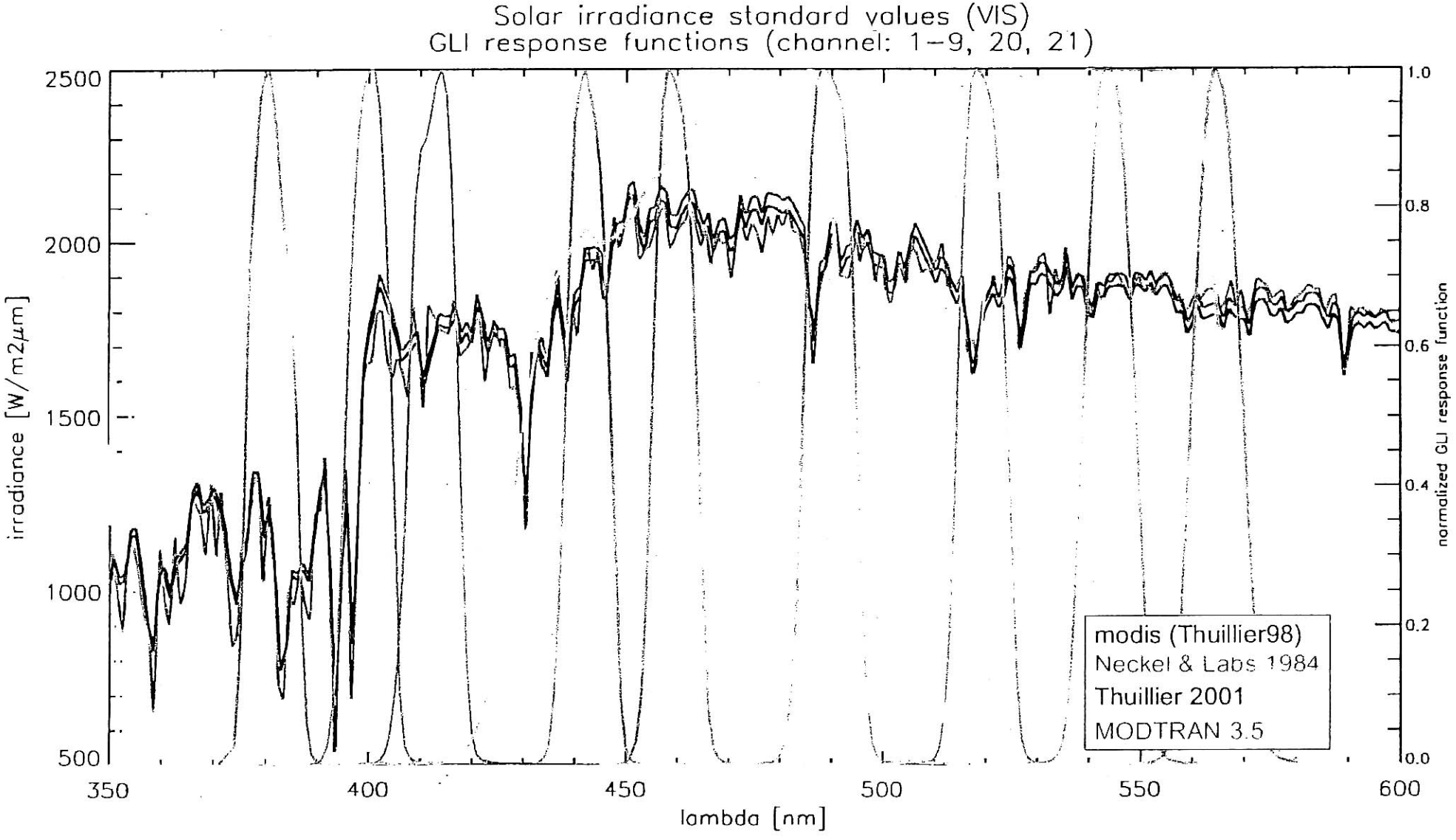
Solar irradiance and GLI response functions



Spectral region: 340-600nm; GLI channel: 1-9, 20,21

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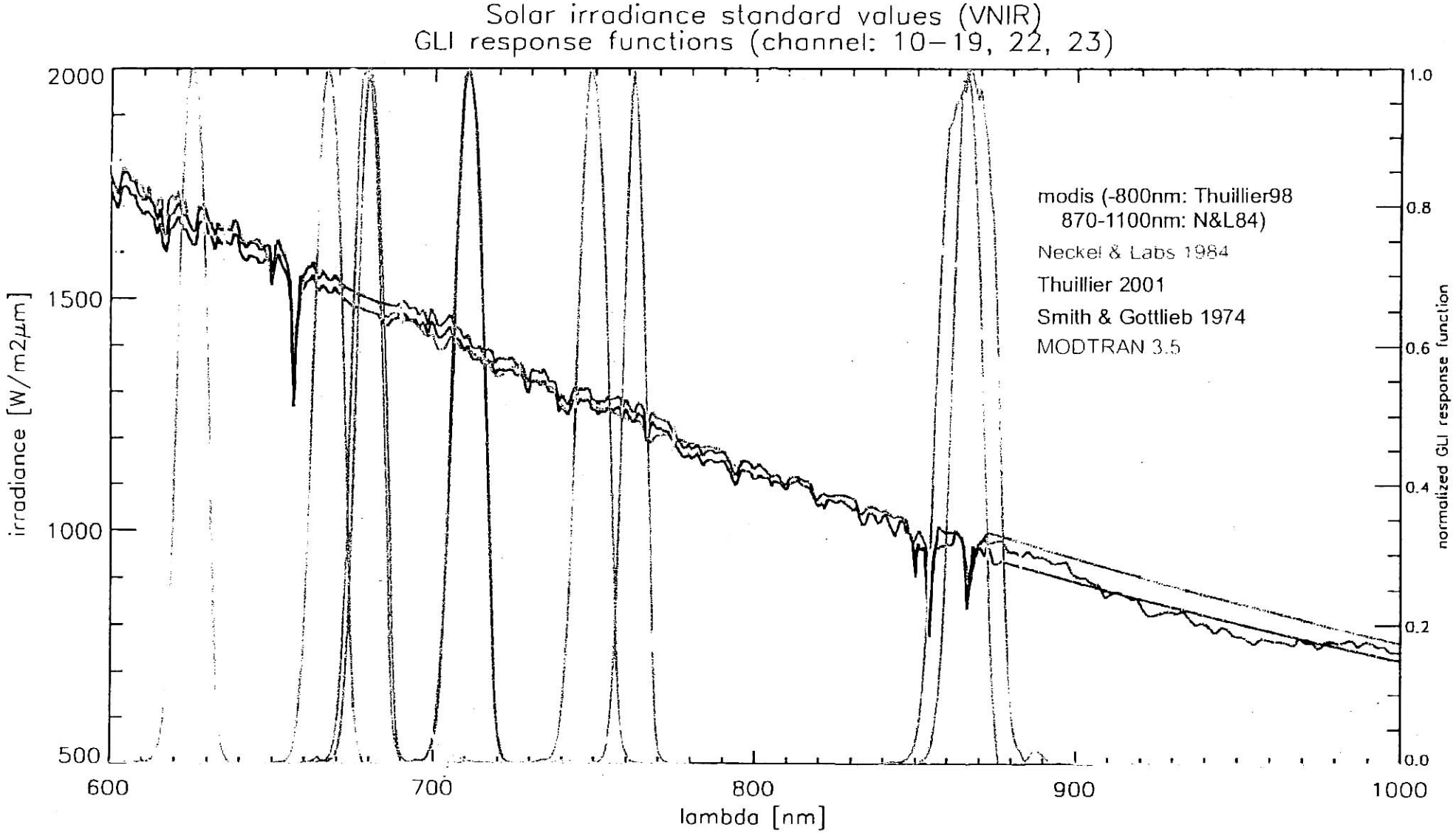

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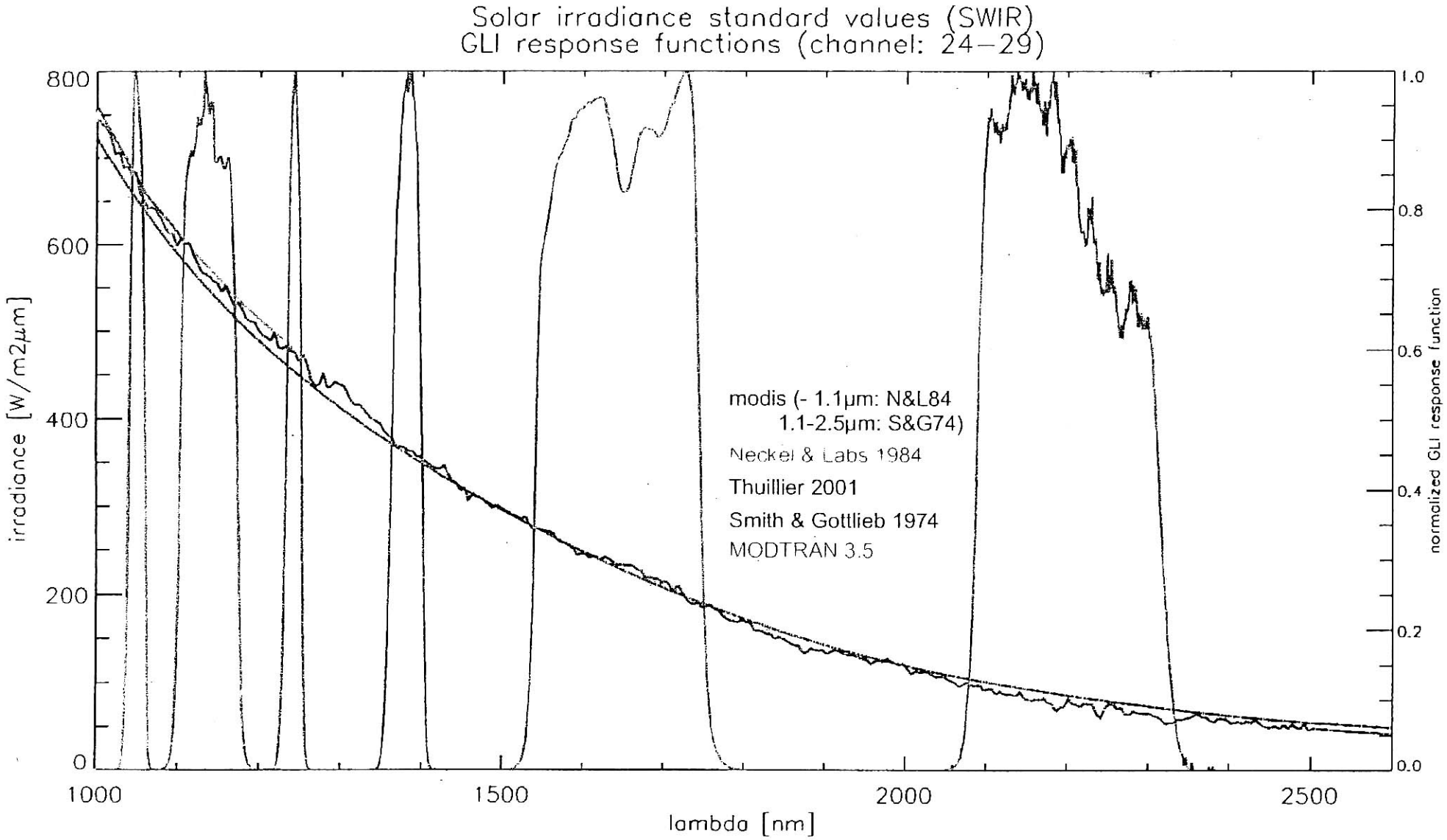

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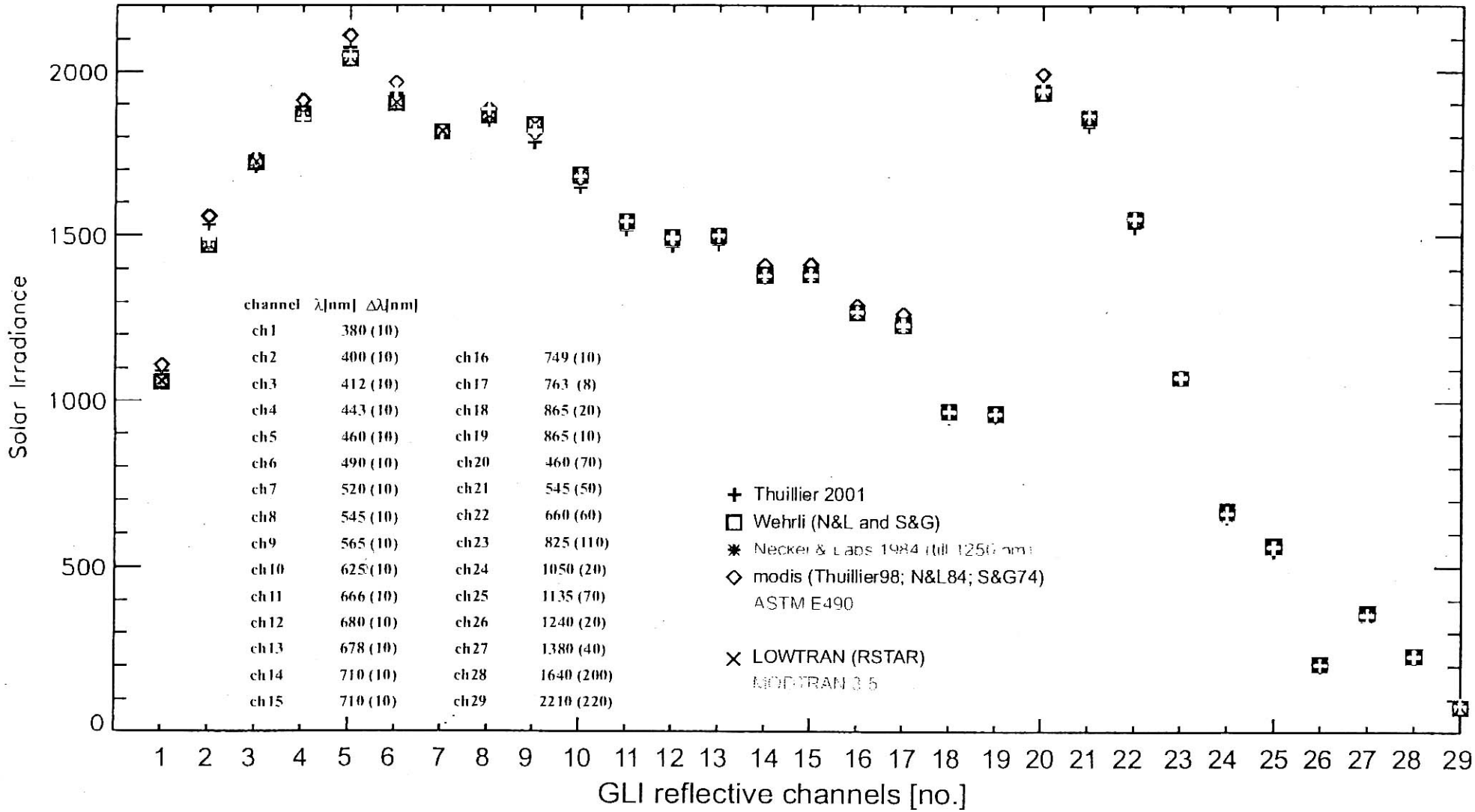
$$\text{Solar Irradiance per GLI channel} = \int_{\lambda 1}^{\lambda 2} E(\lambda)R(\lambda)d\lambda$$



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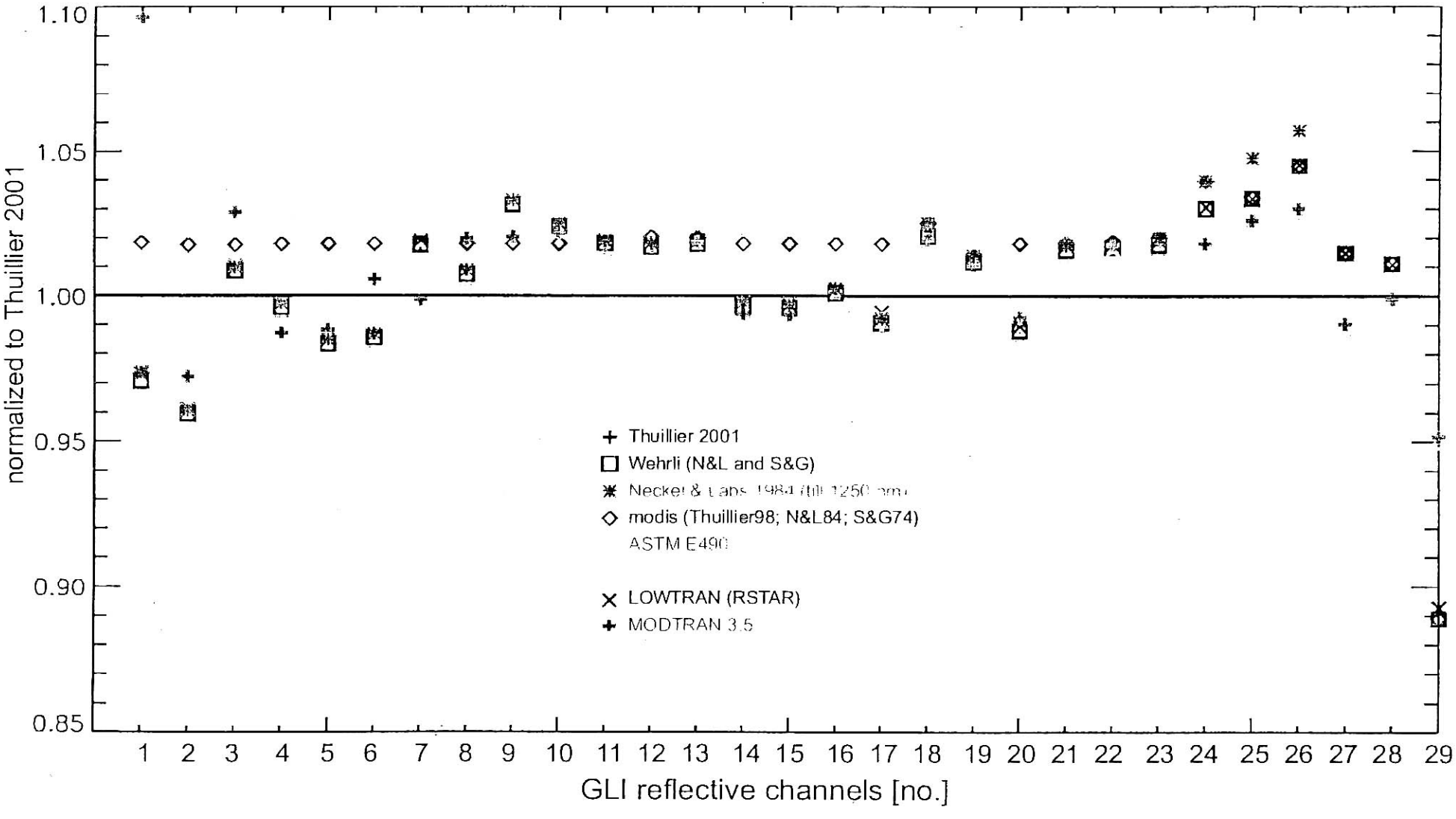

Conclusion

*** Discussion in the science community is ongoing,**

*** GLI leader meeting from Oct. 17 selected the latest Thuillier data (2001) as solar reference**

Experimental solar irradiance data (RMS error: 1.5-2%)

Spectral range: 200–2500 nm

$\Delta\lambda$ = 1 nm (200–870nm) and 20 nm (870–2500nm)

features:

- **high accuracy,**
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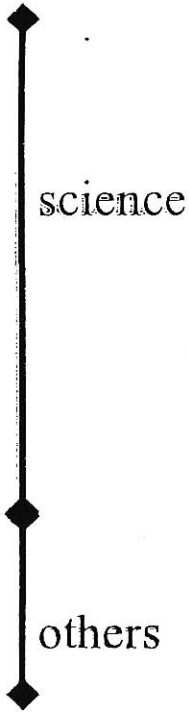

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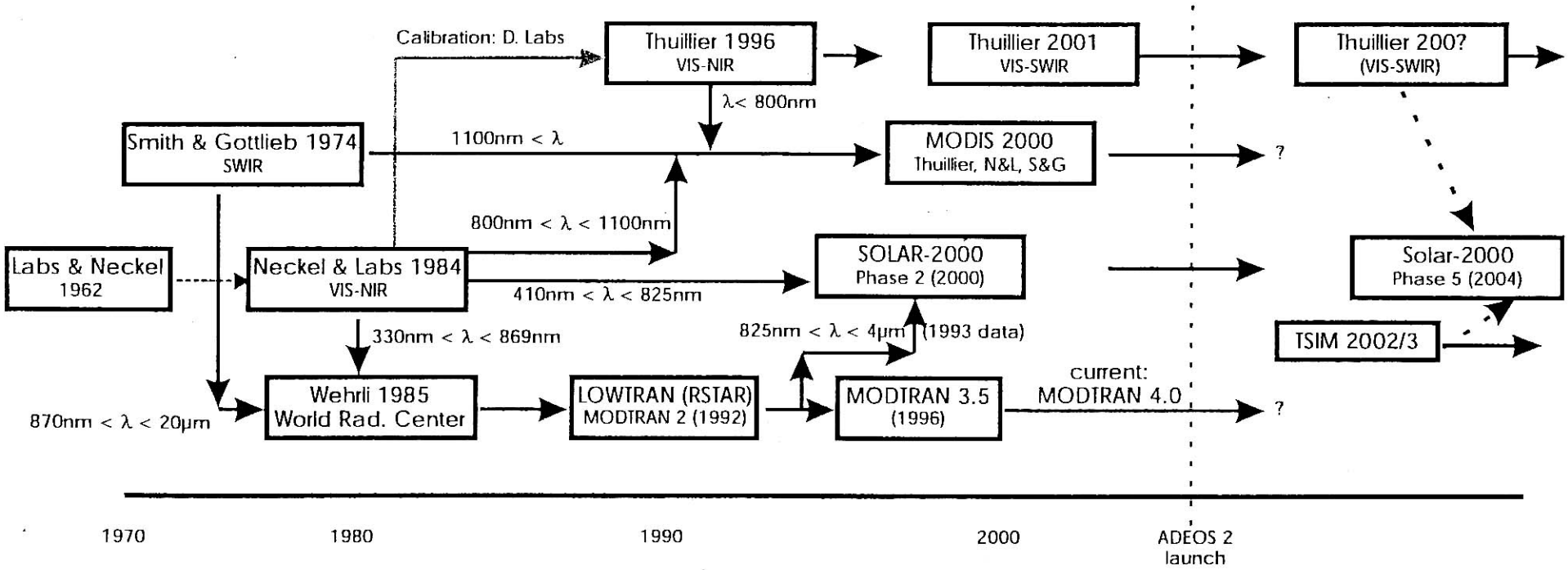

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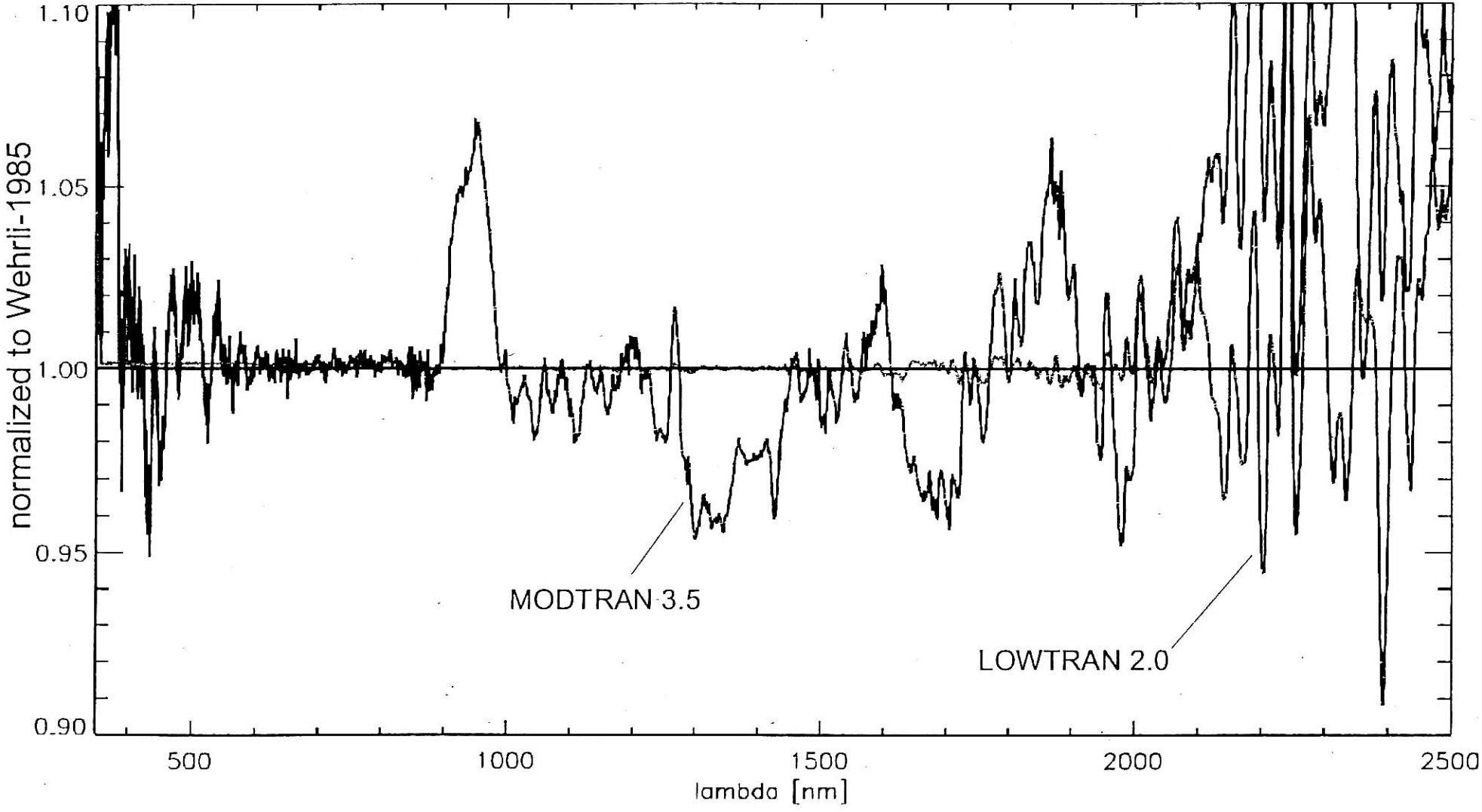

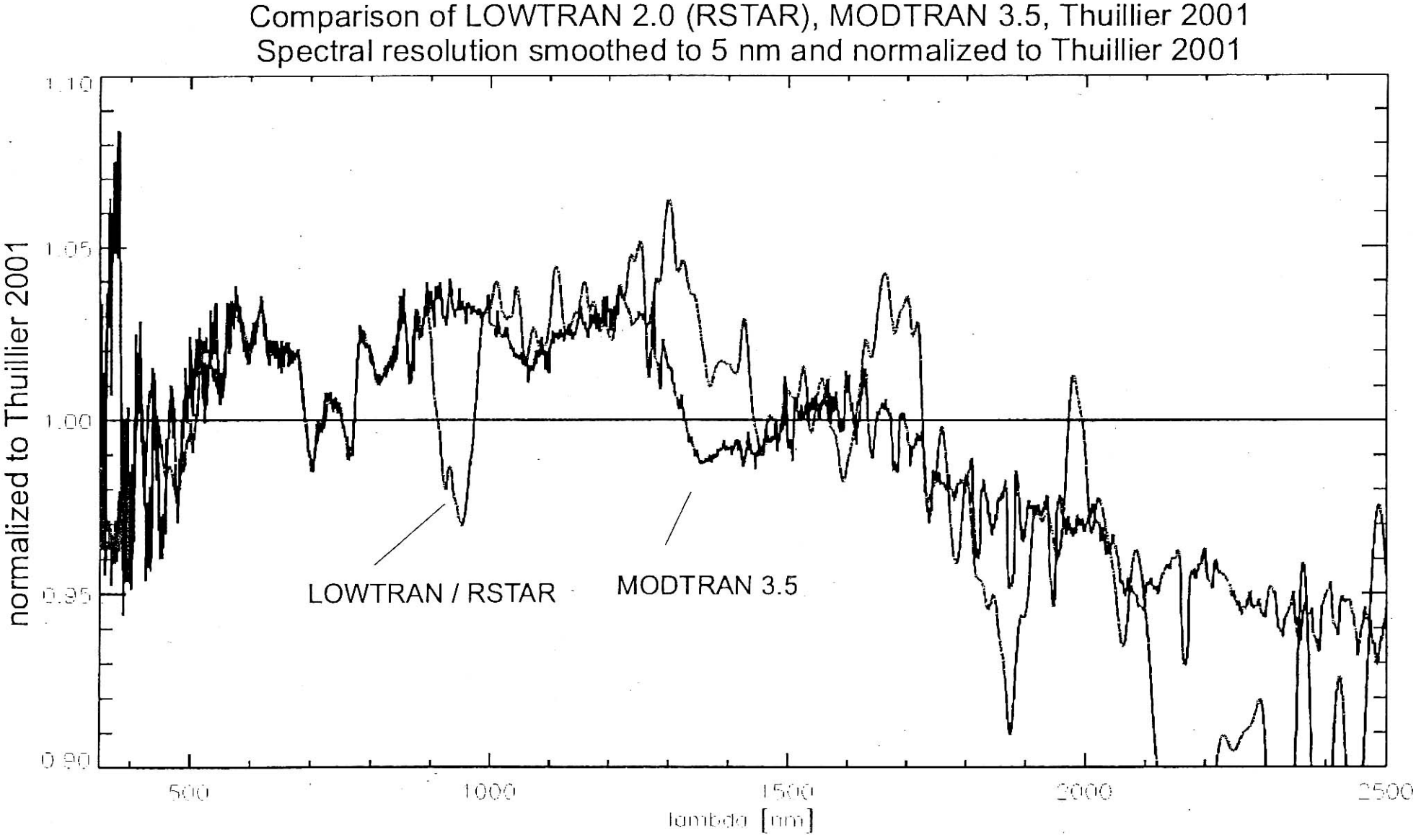
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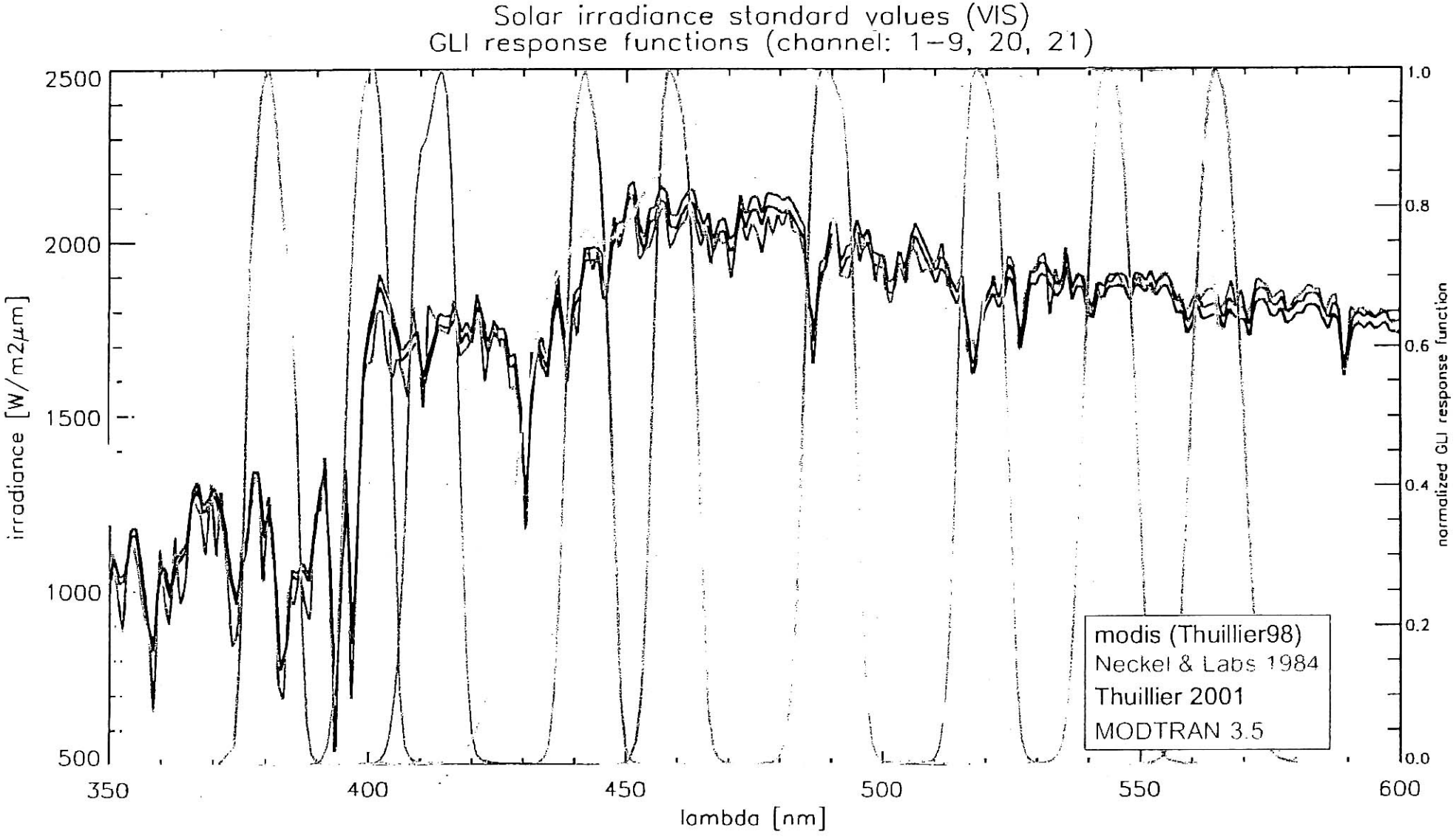

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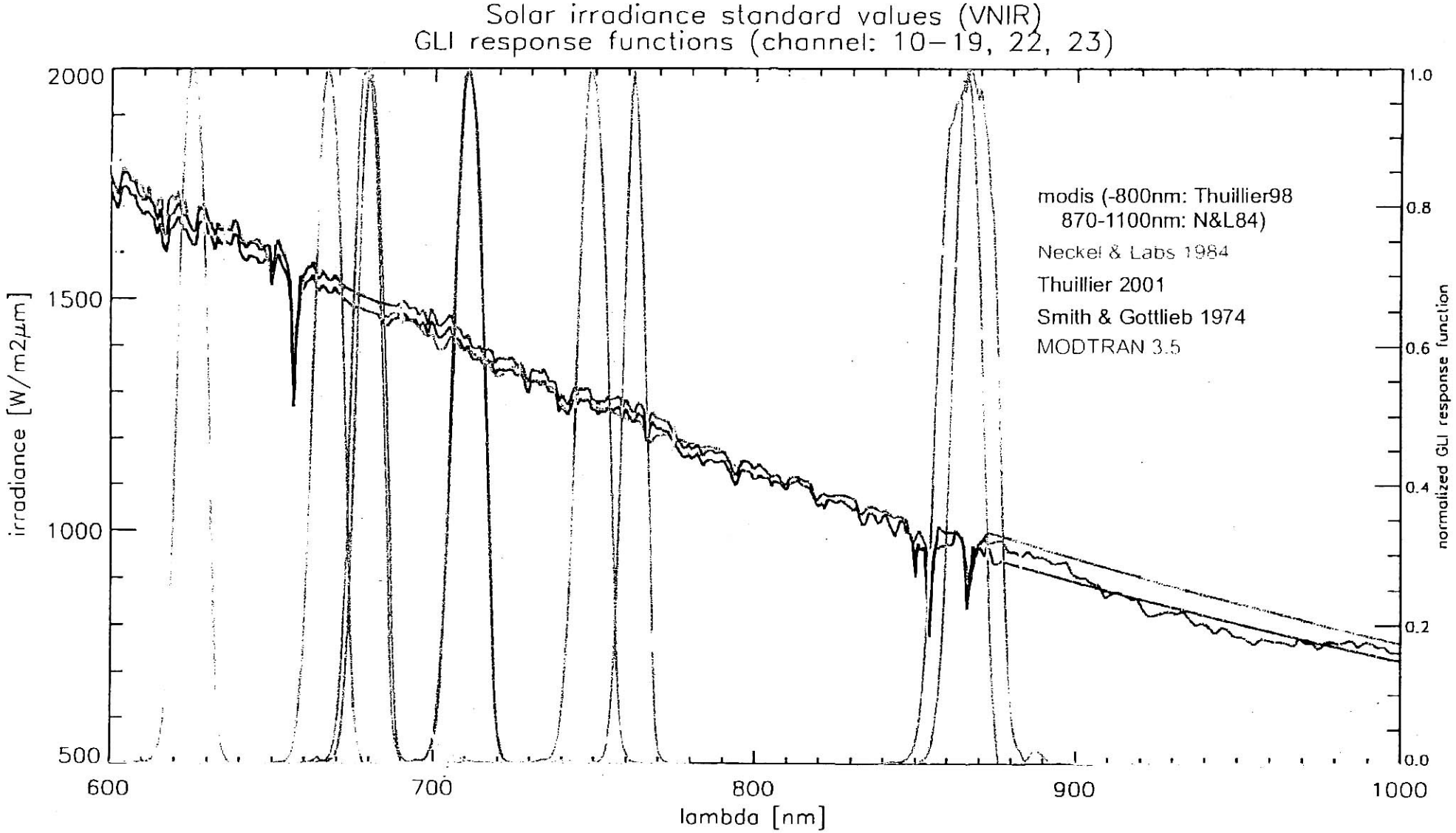

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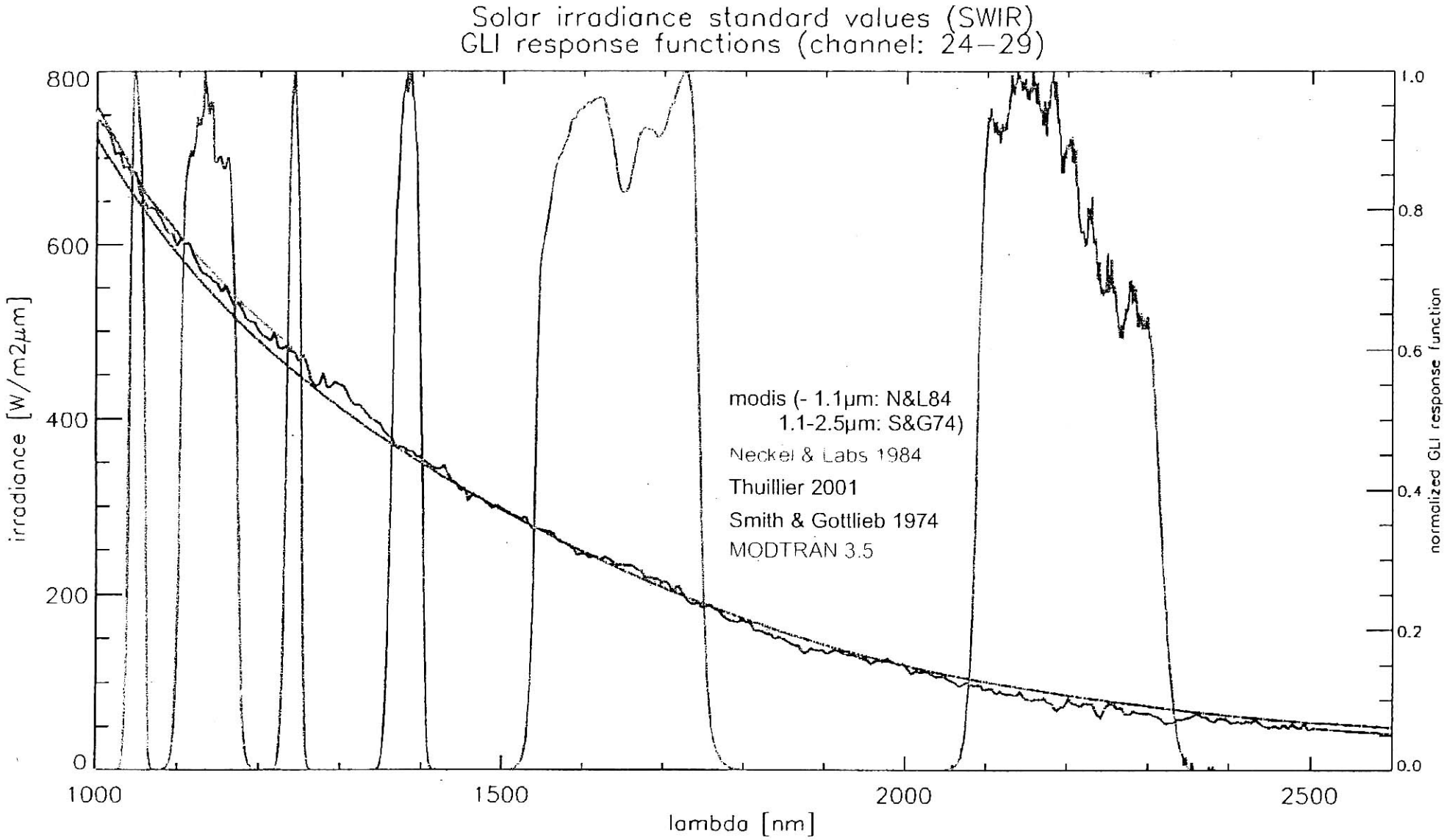

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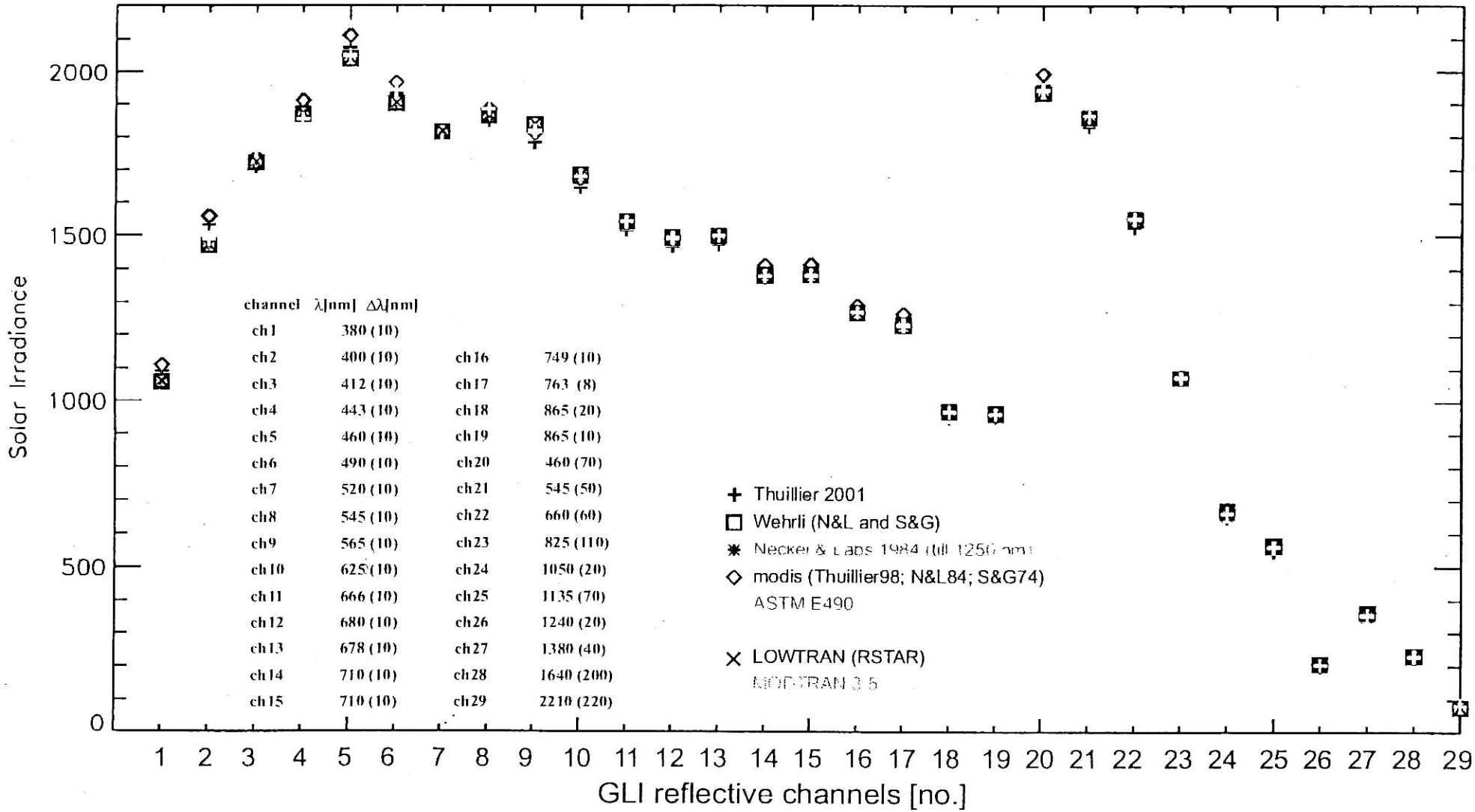

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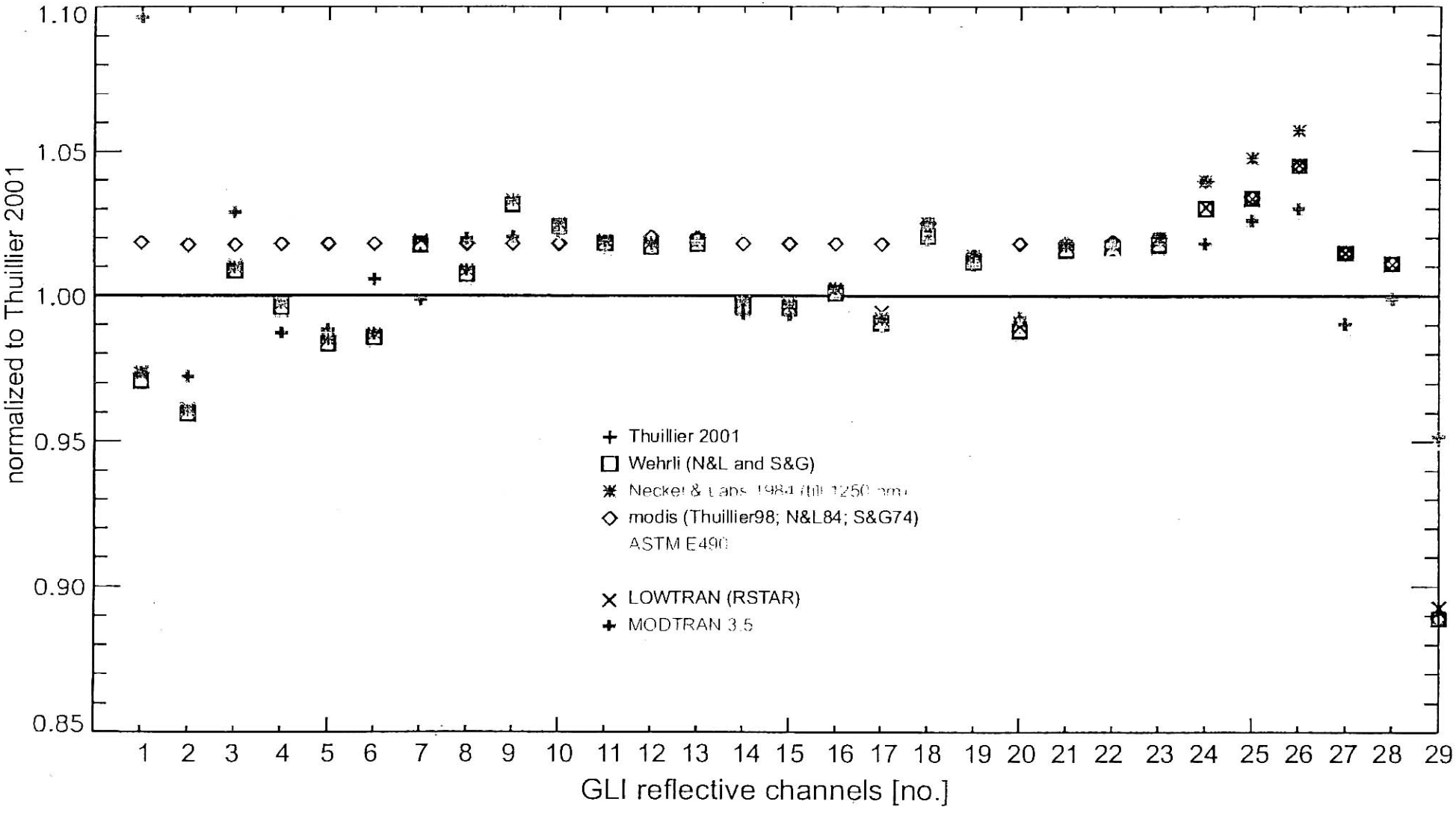

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