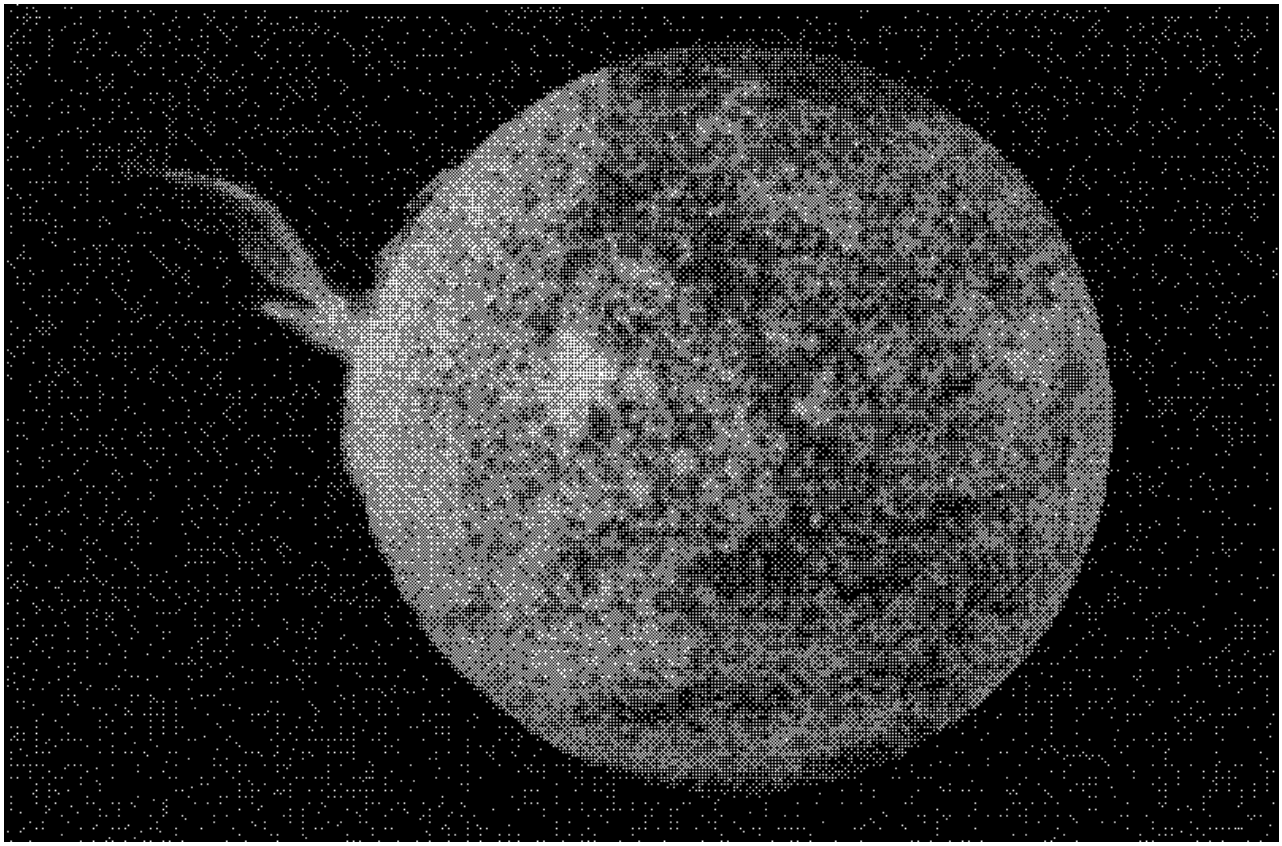
THE FLOW OF ENERGY OUT OF THE SUN

SOFTWARE USERS' GUIDE

A Manual to Accompany Software for
Introductory Astronomy Lab Exercise
Document SUG 5: Version 1



Department of Physics
Gettysburg College
Gettysburg, PA 17325

Telephone: (717) 337-6028
email: clea@gettysburg.edu

Contemporary Laboratory
Experiences in Astronomy

TABLE OF CONTENTS

I. INTRODUCTION 1
I-1. Purpose 1
I-2. Acknowledgements 1
II. SYSTEM REQUIREMENTS 1
III. INSTALLATION AND OPERATION 1
IV. FILES INCLUDED WITH EXERCISE 1
V. USER OPTIONS 2
VI. ASTRONOMICAL DATA, MODELS AND ALGORITHMS 3

I. INTRODUCTION

I-1. Purpose

This document provides specific technical information for users of the CLEA software module "The Flow of Energy Out Of The Sun". It includes discussions of hardware and operating system requirements (Section II); software installation and operation (Section III); files associated with the exercise (Section IV); user options and file formats for possible user modifications (Section V); and astronomical data, models and algorithms employed in the exercise (Section VI). The material in this guide is intended for use by the instructor and by other personnel involved in installing and configuring the exercise software and PC hardware. It is not intended for distribution to the students. (The word "user" when it appears herein should be interpreted as "instructor", and not "student".)

Readers of this document are assumed to have available the **General Users' Guide to CLEA Windows Software**, which contains technical information that applies to all CLEA Windows software. Material contained therein is not repeated here.

I-2. Acknowledgements

Development of CLEA exercises and materials, including this guide, is supported in part by National Science Foundation Grant USE 9155927 and by Gettysburg College.

II. SYSTEM REQUIREMENTS

This software runs on IBM and compatible PCs under Microsoft Windows 3.0/3.1. It requires a hard disk with at least 1.5 MByte of available storage, and a color VGA monitor. For additional information on systems requirements, including a discussion of color modes and video drivers, see the **General Users' Guide to CLEA Windows Software**.

III. INSTALLATION AND OPERATION

All files for this exercise are compacted into the distribution file CLEA_SUN.ZIP. They must be extracted using the PKUNZIP program (also included on the distribution diskette), and placed together in a single directory, such as C:\SUN_LAB. Details of unpacking, running, and installing this software under Windows are given in the **General Users' Guide to CLEA Windows Software**.

IV. FILES INCLUDED WITH EXERCISE

The following files comprise this exercise, and should be present in your working directory after unpacking the distribution (.ZIP) file:

README.SUN - Notes on the current version, including any incompatibilities with previous versions, old files that should be deleted, etc.

UPDATE.SUN - A list of updates (by version) since version 0.50.

USRGUIDE.SUN - This document, in text form

CLEA_SUN.EXE - The executable code for the exercise.

CLEALOGO.BMP - 256-color bitmap data for the CLEA Logo screen.

CLEALG16.BMP - 16-color bitmap data for the CLEA Logo screen.

SUNLAB.BMP - 256-color bitmap data for the Title screen.

SUNLAB16.BMP - A 16-color version of the Title screen.

CLEAHELP.HLP - Text for "Help"..."On Help".

SUNSTRT.HLP - Text for "Help"..."Getting Started".

INTSIM.HLP - Help text for interaction simulation

FLSIM.HLP - Help text for flow simulation

DFSIM.HLP - Help text for diffusion simulation

EMSIM.HLP - Help text for line formation simulation

CNSIM.HLP - Help text for continuum simulation

EXSIM.HLP - Help text for experiment simulation

REMINDER.SUN - Text to display when"Quit" selected.

(SUNOPTS.INI) - NOTE: This file is not included in the distribution, but is created the first time the exercise is run. It contains default settings for file names and options. This file can be deleted if desired, it will then be re-created.

V. USER OPTIONS

See the **General Users' Guide to CLEA Windows Software** for a general discussion of user options, including password access to the options dialog. At this time (Version 0.5), there are no user options available for this exercise except the path and file names, and the password. The file descriptions and default file names are as given in Section IV.

VI. ASTRONOMICAL DATA, MODELS AND ALGORITHMS

The animated simulations that comprise this exercise are random walk models that determine the occurrence of an interaction based on assigned probabilities for line (high) and continuum (low) photons. The probabilities have been adjusted for each separate simulation to give instructive results (an occasional line photon should get through, an occasional continuum photon should be scattered). The direction of travel after an interaction is determined by computing a random floating point number (of approximately 19 decimal digits) between zero and two Pi. That is, the directions are not binned into a number of fixed directions, although the limitations of pixel display may sometimes cause it to seem that way (particularly in the Sun photon diffusion simulation). The random number generator used in all simulations is the "random" function (Borland Pascal, Version 7). The exact algorithm is unknown, but the results do not indicate any obvious biases or periodicities.

Efforts have been made to keep the animation code reasonably efficient. The simulations have been tested and run at an acceptable rate on machines as slow as a 25 MHz 386SX (with a 387 coprocessor). All tested machines slow down visibly when a large number of photons are included in the pulse in the Sun photon diffusion simulation.