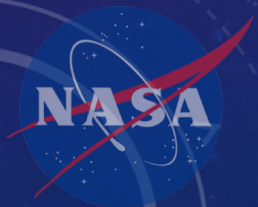# SPACE ROCKS IN THE DESERT

WATCHING THE SKY OVER SOUTHERN ARIZONA FOR METEORITE-DROPPING FIREBALLS
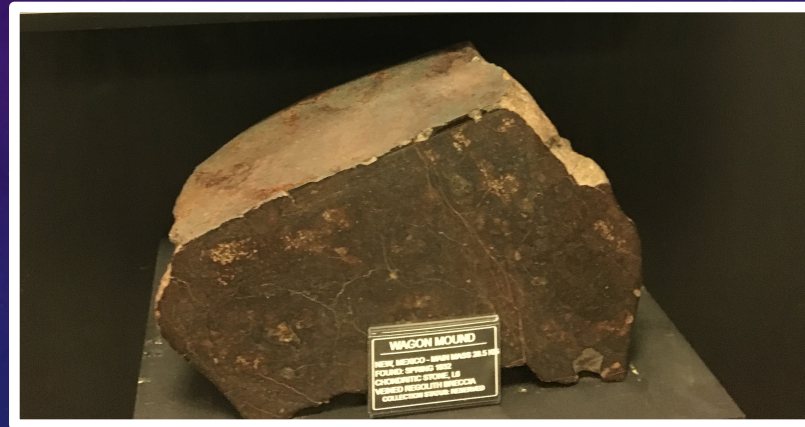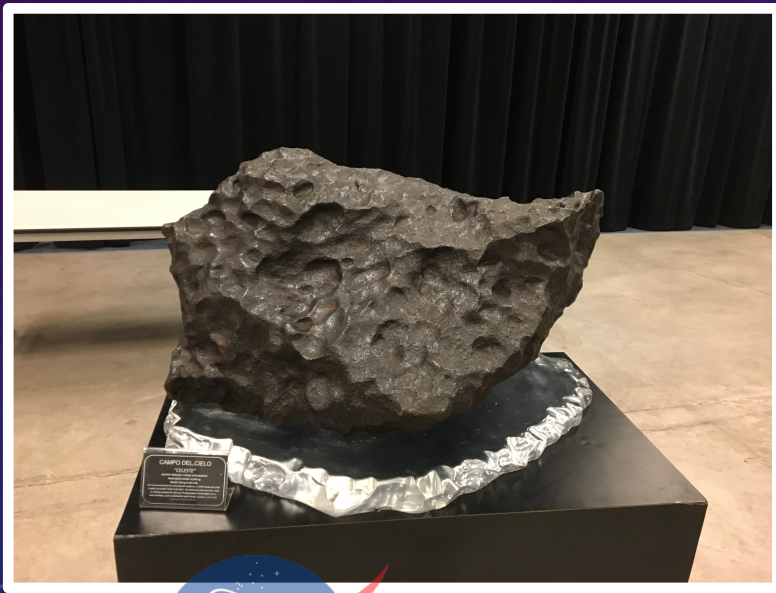
MUNEEB AHMED

MOTIVATION: METEORITES

Chondrites vs. Achondrites:
What can they tell us?

ORIGINAL PROJECT: AUSTRALIA

Source: Desert Fireball Network

Region	Institution	Delivered	Deployed	Need Servicing
DFN	Curtin University	52	52	13
NSW	Macquarie	2	0	0
Victoria	Monash	2	0	0
ACT	ANU	2	0	0
Queensland	USQ	3	2	1
UK	Imperial College	4	3	1
Saudi Arabia	NCA	2	0	0
Morocco	Université Hassan II de Casablanca	4	3	2
Western Canada	University of Western Ontario	3	1	0
Eastern Canada	Alberta	3	2	1
AZ, USA	U of A	4	0	0
CA, USA	SETI Institute	5	4	1
TX, USA	Lunar and Planetary Institue	3	1	0
AL, USA	NASA Meteoroid Environment	3	1	0
Total		**92**	**65**	**26**

SERVICING THE CAMERAS

Microcontrollers, lenses, software, and more

CAPTURING FIREBALLS
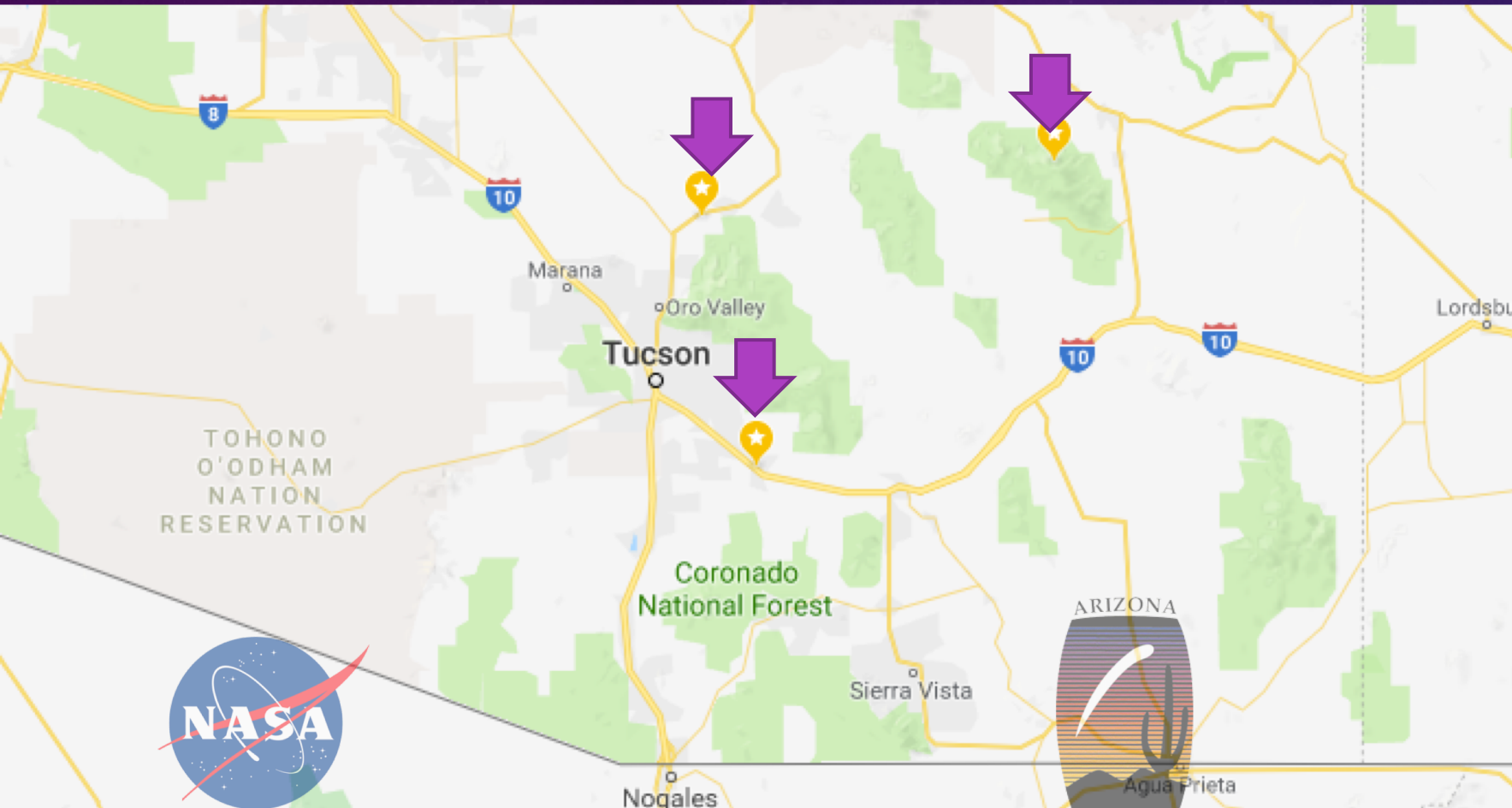
Prime Target:
Meteor Showers

- **Perseids**
- **Leonids**
- **Geminids**

Geminids, December 14, 2017

PROSPECTIVE LOCATIONS

- Biosphere 2
- Vatican Observatory
- Vail

Ideal:
An equilateral triangle
100 km on each side

DATA PROCESSING AND OUTCOMES

```
dfn-user@DFNSMALL24 /opt/dfn-software $ ls
all_sky_video_radiometer.py          enable_cond.py                      monitor_temperature_lin.py
all_sky_video_radiometer_wrapper.sh  enable_ext-hd.py                    monitor_temperature.py
altazi_to_radec.py                   enable_heater.py                    NN.py
altazi_to_radec.pyc                  enable_trigger.py                   performance.py
astrometric_polynomial.py            enable_video.py                     post_event_activities.py
backup                               error_handler.py                    post_event_activities_XP.bat
basic_mask.png                       error_handler.pyc                   preFilter.py
camera_auto_shot.py                  event_astrometry.py                 processing_auto_calibrate.py
camera_delete_all.py                 event_filter.py                     processing_auto_mask.py
camera_download_all.py               geometry.py                         processing_create_mask.py
camera_image_count.py                geometry.pyc                        processing_daemon.py
camera.py                            graphic_report.py                   processing_event_detection.py
camera.pyc                           GUI                                 processing_event_detection.pyc
camera_space_use.py                  hard_reset.py                       processing_NN_detection.py
cloudstatus.txt                      hardware_logging.py                 processing_NN_training.py
cloudy_check.py                      housekeeping_daily.py               processing_streak_detection.py
cloudy_check.pyc                     housekeeping_transfer.py            processing_wrapper_latest.sh
config_handler.py                    housekeeping_transfer.pyc           processing_wrapper.py
config_handler.pyc                   housekeeping_transfer_test.sh       processing_wrapper_test.sh
daily_clean_up_operations.py         housekeeping_walk_data.py           r2_northam_25s.tar.gz
daily_clean_up_XP.bat                images_scan_transfer.py             radec_to_altazi.py
daily_reconnect_link_XP.bat          images.txt                          ransac.py
dcraw_batch.sh                       __init__.py                         rawpixels_to_xy.py
dcraw_conv_to_tiff.sh                #interval_control_lin.py#           rawpixels_to_xy.pyc
dcraw_extract_jpg.sh                 interval_control_lin.py             remove_except_10sec_exposures.sh
dcraw_extract_tiff.sh                interval_control_lin.py~            rename_all_dir.py
dcraw_jpg.sh                         interval_control_no_leostick_lin.py rename_all_dir.pyc
dfn_functions.py                     interval_control.sh                 ShutterDriverATmega32u4_25s_2014-04-01.hex
dfn_functions.pyc                    interval_control_test.sh            ShutterDriverSimplifiedSequenceGeneration_6_2_bulb.hex
dfn-software_install.sh              LatLongUTMconversion.py             stack_tiff_to_star_trails.py
dfnstation.cfg                       LatLongUTMconversion.pyc            sun_and_moon.py
dfnstation.cfg.nikkor10.5            lc_shutter_test.py                  sun_and_moon.pyc
dfnstation.cfg.old                   leostick_get_status.py              sunrise.py
disable_camera.py                    leostick.py                         tether_hook.sh
disable_camera_shutter.py            leostick.py~                        thumbnail_and_mask_make_dir.py
disable_cond.py                      leostick.py.backup                  thumbnail_make_100.py
disable_ext-hd.py                    leostick.pyc                        thumbnail_make.py
disable_heater.py                    leostick_reset_gpio.py              tidy_files_to_correct_dirs.py
disable_trigger.py                   leostick_reset_usb.py               touch_to_exposure_date.sh
disable_video.py                     link_functions.py                   update_cfg.py
dslrremote_python.bat                link_functions.pyc                  up.py
dslrremote_python.py                 memory.sh                           version_report.py
enable_camera.py                     micro_firmware_26_may_2017.hex      xy_to_altazi.py
enable_camera_shutter.py             micro_firmware_30_may_2017_27s.hex  xy_to_altazi.pyc
dfn-user@DFNSMALL24 /opt/dfn-software $
```

- **Each of hundreds of raw images is 40+ MB**
- **Local processing on camera detects meaningful events**
- **Logs and event data are sent back to Australia**
- **Specific images can be downloaded remotely**

ACKNOWLEDGEMENTS

- **Dr. Phil Bland**

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- **Martin Cupak**

- **Ben Hartig**

- **Dr. Tim Swindle**

- **Carl Hergenrother**