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Quick Links to Data Access

Ways to Access APOGEE Data This page provides a summary of the available outputs from the • Table of Contents different stages of the APOGEE pipelines. These can be obtained via a number of tools.

(SAW), and the Catalog Archive Server (CAS). File formats are described in the data model and we provide some examples for how to use these resources. However, many users will be satisfied with the final allStar catalog on the SAS, which gives radial velocities, stellar parameters, and abundances for each star, obtained from the combined spectra. Users should consult the "Using APOGEE Data" pages for further instructions on how to properly use and analyze the APOGEE data. **APOGEE Quick Links** I want to ... Tool **Tool Description** The SAS houses parameter summary catalogs, spectra, and all intermediate data products in flat files within a see also this caveat) directory structure. Download full files to my computer and write Science Archive Server As described in **Supplemental** programs to use the (SAS) **Analyses** there are multiple data. file trees in DR17 using

We provide three primary tools to access the APOGEE data: the Science Archive Server (SAS), the Science Archive Webapp

☆ allStar File (4.0 Gb, datamodel, but ☆ allStarLite (1.8 Gb, data model) ☆ allVisit File (2.8 Gb, datamodel) different libraries. The default library is synspec with results in the synspec rev1 filetree. (See <u>Caveat</u> for details) The SAW contains spectra and associated parameters in a ☆ Infrared Spectrum Search searchable interactive Use a Web-based GUI Science Archive interface to select interface. Webapp (SAW) ☆ Infrared Spectrum View Stars targets or view spectra. The SAW is loaded from the synspec rev1 filetree. The CAS contains the information from the summary catalogs in a queryable database structure ☆ <u>IR Spec Query Form</u> Query a database with Catalog Archive Server that can be accessed through SQL to define a sample. the SkyServer or directly via (CAS) ☆ CasJobs SQL Query SQL. The CAS is loaded from the

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Science Archive Server (SAS)

The entire spectroscopic dataset, at each stage of its data processing, is available through the SAS. For APOGEE, the entire set of visit and combined spectra can be found under the APOGEE_REDUX directory, as described by the datamodel. The entire set of ASPCAP files can be found under the APOGEE_ASPCAP directory (as described by the datamodel . It is possible to download files in bulk as described on the bulk downloads page. DR17 does include several "supplemental analyses" for ASPCAP stellar parameters and abundances, for more information

synspec filetree.

on these see the supplementary analysis page. In the subsections to follow, we describe some of the main data files and explain how to find these in the SAS.

Summary catalogs The tables below give the summary catalog files in FITS format on the SAS. These are found in the following

directory: /sas/dr17/apogee/spectro/aspcap/dr17/synspec (but see also this caveat) **Summary Catalogs**

File Name & Direct Link Contents summative catalog containing all quantities for <u>allStar-dr17-synspec_rev1.fits</u> (4.0 Gb) each combined spectrum

See also <u>Caveat.</u> allStarLite-dr17-synspec rev1.fits (1.8 Gb) "lite" summative catalog containing a reduced set Data Model of quantities for each combined spectrum summative catalog containing quantities derived Data Model allVisit-dr17-synspec rev1.fits (2.8 Gb) from each individual visit spectrum catalog of Cannon stellar parameters and abundances Not produced in DR17; DR15 Cannon <u>Data Model</u> Please see <u>DR15 Data Access Documentation</u> for details on how to retrieve these files.

Spectral Data Combined ASPCAP Spectrum:: aspcapStar

The pseudo-continuum normalized, combined spectrum, with best matching synthetic ASPCAP spectrum is recorded as one file per object in the aspcapStar file (data model). These are sorted by telescope and field, and can be found in the SAS using a path constructed as follows:

Combined Spectrum:: apStar or asStar

/sas/dr17/apogee/spectro/aspcap/dr17/synspec_rev1/TELESCOPE/FIELD/ The file name is constructed as: aspcapStar-dr17-APOGEE_ID.fits Where TELESCOPE, FIELD and APOGEE_ID are tags for each object that can be found in the allStar (or

The combined, RV-corrected spectra are recorded as one file per object in the apStar or asStar files, where apStar files are created for objects observed by the northern spectrograph and asStar files are created for objects observed by the southern spectrograph. These are sorted by telescope and field, and can be found in the SAS using a path constructed as follows: /sas/dr17/apogee/spectro/redux/dr17/stars/TELESCOPE/FIELD The filename is constructed as:

equivalent) summary file. Thus, to acquire this file, the user can build the URL from information in the allStar file.

apStar-dr17-APOGEE_ID.fits, asStar-dr17-APOGEE_ID.fits In the allStar (or equivalent) summary file, the filename for the combined spectrum is contained in the FILE tag. Thus, the user can build the URL from information contained in the allStar file. Visit Spectrum:: apVisit or asVisit The individual visit spectra are recorded as one file per visit in the apVisit or asVisit files. These are sorted by telescope, plate, MJD, and FIBERID. These files can be found in the SAS using a path constructed as follows:

/sas/dr17/apogee/spectro/redux/dr17/visit/TELESCOPE/FIELD/PLATE/MJD The filename is constructed as: apVisit-dr17-PLATE-MJD-FIBERID.fits or asVisit-dr17-PLATE-MJD-FIBERID.fits

This information can be acquired from the allVisit summary file, or in the VISITS tag of the allStar file. The

VISITS tag contains a comma-separated list of the visit file names (without .fits appended). Summary Table for Spectral Data **APOGEE File Name** Contents SAS Path Data Model /sas/dr17/apogee/spectro/aspcap Pseudo-continuum normalized, aspcapStar combined spectrum, with best /dr17/synspec_rev1/TELESCOPE/ matching synthetic ASPCAP spectrum, FIELD/aspcapStar-dr17-APOGEE_ID.fits one file per object Combined spectrum, one file per /sas/dr17/apogee/spectro/redux apStar/asStar /dr17/stars/TELESCOPE/FIELD/FI <u>Model</u> object LE apVisit/asVisit Individual visit spectrum, one file per /sas/dr17/apogee/spectro/redux <u>Data</u> /dr17/visit/TELESCOPE/FIELD/PL <u>Model</u> visit ATE/MJD/filename

In addition to the summary catalogs and spectral data, all intermediate data products are also provided in the data release. Here the process is presented in the order of operations from targeting to final ASPCAP parameters and abundances. The pipeline code is available on github: sdss/apogee.

apogee2Field/apogeeField

Intermediate Data Products

Targeting Field Summary Files DR17 includes four types of files containing useful information on the stars (both targeted and non-targeted) in APOGEE fields and on the fields themselves, the designs, and the plates in which the targets are organized (see

further details on this organizational structure in Zasowski et al. 2013 and Zasowski et al. 2017). All summary files can be found in this directory: /sas/dr17/apogee/target/ Targeting Field Summary Files Description Data Model Summary File

Summary file that contains information for all fields, such

as central coordinates

Data Model

Data

contains information on the individual designs, or groups apogee2Design/apogeeDesign Data Model of stars, like color limits and cohort fiber allocations contains information on the physical plates, such as drill apogee2Plate/apogeePlate Data Model In addition to these summary files, we also have the targeting input files that are used to design each plate. These are organized by survey and by field. They are contained in folders within sas/dr17/apogee/target/ and the links provided below go to the proper sub-directory. Targeting Input Files Field File Description Data Model

contains photometric and proper motion information on the candidate <u>Data Model</u> apogee20bject targets in the APOGEE-2 fields; one file for each field in the survey. <u>Data Model</u> apogeeObject contains photometric and proper motion information on the candidate targets in the APOGEE-1 fields; one file for each field in the survey. contains photometric and proper motion information on the candidate Similar to apogee1m0bject targets in the APOGEE 1m fields; one file for each field in the survey. <u>apogeeObje</u> <u>ct</u> **Observation Files** APOGEE raw image data are also available on the SAS. These are organized by telescope and MJD. To find these files, the user needs to have acquired the MJD for each visit in the allVisit file.

Files Generated during Data Collection **Location of Files TELESCOPE** Telescope apo25m Apache Point Observatory apogee/spectro/data/MJD

2.5 meter Las Campanas Observatory lco25m apogee/spectro/data2s/MJD 2.5 meter Apache Point Observatory apo1m apogee/spectro/data1m/MJD 1.0 meter The raw data files are named apR-CHIP - EXPOSURE .apz for data taken by the northern spectrograph and asR-CHIP - EXPOSURE .apz for data taken by the southern spectrograph. The CHIP can be "a", "b", or "c", where

these letters correspond to the "red", "green", and "blue" APOGEE detectors, respectively.

input or

File

ap2D), as well as the APOGEE reduction paper (Nidever et al. 2015) before using these files. Visit Level Processing The visit-level processing occurs in a code called apred and is described on Visit Reduction. These are are organized by telescope, FIELD, PLATE, and MJD. The file path is constructed as follows: /sas/dr17/apogee/spectro/redux/dr17/visit/TELESCOPE/FIELD/PLATE/MJD/

Files used or created by apred for Visit Processing

File Description

The intermediate-level ap2D and ap1D files are available, but users should consult the data models (ap1D and

Model output the apred processing plan apPlan/asPlan <u>Data</u> input <u>Model</u> calibrated spectra file for each chip of each exposure apCFrame/asCFrame <u>Data</u> output <u>Model</u> Summary file for all exposures of each chip containing apPlate/asPlate <u>Data</u> output the 300 combined flux- and wavelength-calibrated spectra apPlateSum/asPlateSum output Summary file with metadata for the objects with apPlate/asPlate files for a given object on a given plate/MJD the combined apVisit/asVisit <u>Data</u> output flux- and wavelength-calibrated spectra for all <u>Model</u> exposures Summary file with the derived parameters for objects apVisitSum output with apVisit/asVisit files (no spectra) **Combined Spectra**

The visit spectra for each target are combined as described on the visit combination page. This occurs in the following directory: /sas/dr17/apogee/spectro/redux/dr17/stars/TELESCOPE/FIELD Files Created for Visit Combination

File **File Description** input or Data Model output Combined spectrum for an individual object. apStar/asStar output <u>Data</u> <u>Model</u> one for each object apStarLSF output <u>Data</u> **Model** Radial velocities and target information for all stars in a apField/asField output <u>Data</u> given field <u>Model</u> Table of individual visit RVs for a given field apFieldVisits output <u>Data</u> <u>Model</u> APOGEE Stellar Parameters and Chemical Abundances Pipeline (ASPCAP) The ASPCAP stellar parameters pipeline produces one intermediate file for each field that is then merged to form the allStar summary file. These "aspcapField" files are found in the aspcap directories sorted by telescope and field.

Files created by ASPCAP File File Description input or Data Model output ASPCAP stellar parameters (logg, Teff, [M/H], etc.), normalized <u>Data</u> aspcapField output spectrum, and best fit spectrum for each stars in a given field. <u>Model</u>

/sas/dr17/apogee/spectro/aspcap/dr17/synspec_rev1/TELESCOPE/FIELD/aspcapField-FIELD

The following Value Added Catalogs (VACs) are available for the DR17 datasets: ☆ Open Clusters -- Provides membership analysis for stars in the vicinity of known open clusters ☆ The Joker -- Provides stellar orbital parameters from modeling multi-epoch RV measurements using The Joker ☆ SB2 -- Provides spectroscopic binary identifications

filetree. (See this Caveat).

DR17 Value Added Catalogs

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☆ APOGEE NET -- Provides an independent analysis of APOGEE spectra using neural nets ☆ Red Clump -- Provides a catalog of red clump stars using spectro-photometric selections. ☆ AstroNN -- Provides stellar parameters, elemental abundances, distances, and ages from a neural network-based code trained on the spectra; orbital parameters are provided using these distances and GalPy.

Note: All VACs were produced with the results synspec filetree, whereas we recommend use of the synspec_rev1

☆ StarHorse -- Provides distances and extinctions using spectro-photometry for all stars in DR17 ☆ APOGEE-Centric Fire Simulations -- Provides mock catalogs with APOGEE-error model using the Ananke framework to sample the Latte Simulations

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Catalog Archive Server (CAS) Note: The CAS is loaded with the results in the synspec filetree. (See this Caveat). APOGEE target information and derived radial velocities, stellar parameters, and elemental abundances are loaded into the

Additional Value Added Catalogs will be made public in 2022.

Catalog Archive Server (CAS) database. CAS contains a number of ways of interfacing with the database, including SQLbased access through the CasJobs portal that allows you to save and analyze all your search results.

The SkyServer Explore tool provides a quick way to find APOGEE spectra for the desired object. The QuickLook pane shows an image and spectrum for each SDSS object. For objects with APOGEE spectra, the tool includes an APOGEE section. The

APOGEE section of the Explore tool shows a composite spectrum, radial velocities, and derived stellar atmospheric parameters, while also providing links to additional data, including the spectrum as a FITS file. All APOGEE catalog data are available through the search tools of SkyServer. The Infrared Spectroscopy Query Form lets you search for APOGEE catalog objects by position, spectral classification, velocity, and other constraints from

spectroscopic and/or photometric parameters. SQL Search lets you create your own search using the SQL database programming language; see the SkyServer SQL Tutorial to learn how to write SQL queries. We provide some use-cases for the CAS tools on Examples.

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Science Archive Webapp (SAW) Note: The SAW is loaded results from the synspec_rev1 filetree. (See this Caveat). The Science Archive Webapp (SAW) provides a searchable interface for infrared spectra and includes both an interactive view of the spectra and a data download facility (supports both rsync and wget):

☆ Infrared Spectrum View Visits ☆ Infrared Spectrum View Stars ☆ Infrared Data Access API

☆ Infrared Plate Search

☆ Infrared Spectrum Search

The SAW permits some simple object searches as well as interactively plots their associated spectra. It can also be used to construct lists of spectra to be downloaded in bulk; see further instructions in Bulk Data Downloads. We provide some use-cases for the SAW tools on Examples.

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Backward Compatibility The DR16 release involved a major reorganization of the SAS file structure for APOGEE data that is maintained in DR17. For

consistency with previous data releases, we provide the equivalent pipeline versions here. Users wishing to access data

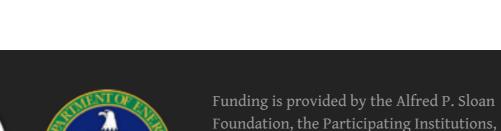
DR17 Pipeline Versions APOGEE tags each stage of its pipeline with specific version numbers that are then included in the file names and

as tags in the allStar (or equivalent) summary file. DR17 uses the following reduction/configuration versions: ☆ APRED_VERSION:: dr17 ☆ APSTAR_VERSION:: stars

from data releases are advised to refer to those pages, e.g., DR15 Data Access.

☆ ASPCAP_VERSION:: synspec ☆ **RESULTS_VERSION**:: OBSOLETE





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