U. S. DEPARTMENT OF THE INTERIOR
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PRELIMINARY MAP OF SELECTED POST-NEVADAN GEOLOGIC FEATURES OF THE KLAMATH MOUNTAINS AND ADJACENT AREAS, CALIFORNIA AND OREGON: A DIGITAL DATABASE

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Open - File Report 97-465

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This database, identified as "Preliminary map of selected post-nevadan geologic features of the Klamath Mountains and adjacent areas, California and Oregon: A digital database," has been approved for release and publication by the Director of the USGS. Although this database has been reviewed and is substantially complete, the USGS reserves the right to revise the data pursuant to further analysis and review. This database is released on condition that neither the USGS nor the U. S. Government may be held liable for any damages resulting from its use.

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INTRODUCTION

This Open-File report is a digital geologic map database. This pamphlet serves to introduce and describe the digital data. There is no paper map included in the Open-Filereport. The report does include, however, a PostScript plot file containing an image of thegeologic map sheet and a second PostScript plot file with a geologic description.

The geologic map database delineates map units that are identified by general age, lithology and clast size following the stratigraphic nomenclature of the U. S. Geological Survey. For detailed descriptions of the units, their stratigraphic relations and sources of geologic mapping, consult the accompanying PostScript plot file (kla-geo.ps or kla-geo.txt). The scale of the source map limits the spatial resolution (scale) of the database to 1:500,000 or smaller.

For those interested in this database who do not use an ARC/INFO compatible Geographic Information System (GIS), but would like to obtain the paper map with explanation, one PostScript plot file containing map images of the data in the digital database, as well as a PostScript plot file of the explanatory text, have been included in the database package (please see the section "PostScript Plot Files Package" page 5). The plot files require gzip and tar utilities to access the files.

For those without computer capability, we have made the plot files available to an outsidevendor, or we can provide users with the PostScript plot files on tape that can be used byother vendors (please see the section "Obtaining Plots from an Outside Vendor" page 5).

The content and character of the database and methods of obtaining it are described herein. The geologic map database itself, consisting of three ARC coverages and one base layer, can be obtained over the Internet or by magnetic tape copy as described below. The processes of extracting the geologic map database from the tar file, and importing the ARC export coverages (procedure described herein), will result in the creation of an ARC workspace (directory) called 'klam.'

The database was compiled using ARC/INFO version 7.0.4, a commercial Geographic Information System (Environmental Systems Research Institute, Redlands, California), with version 3.0 of the menu interface ALACARTE (Fitzgibbon and Wentworth, 1991, Fitzgibbon, 1991, Wentworth and Fitzgibbon, 1991). It is stored in uncompressed ARC export format (ARC/INFO version 7.x) in a compressed UNIX tar (tape archive) file. The tar file was compressed with gzip, and may be uncompressed with gzip, which is available free of charge via the Internet from the gzip Home Page (http://w3.teaser.fr/~jlgailly/gzip). A tar utility is required to extract the database from the tar file. This utility is included in most UNIX systems, and can be obtained free of charge via the Internet from Internet Literacy's Common Internet File Formats Webpage (http://www.matisse.net/files/formats.html). ARC/INFO export files (files with the .e00 extension) can be converted into ARC/INFO coverages in ARC/INFO (see below) and can be read by some other Geographic Information Systems, such as MapInfo via ArcLink and ESRI's ArcView (version 1.0 for Windows 3.1 to 3.11 is available for free from ESRI's web site: http://www.esri.com).

DATABASE CONTENTS

The first digital package consists of one PostScript plot file of the geologic map, explanation and correlation chart, a second PostScript plot file of the geologic description and references, and a third PostScript plot file showing sources of data. A second digital database package consists of the geologic map database itself and the supporting data, including the base map, map explanation, geologic description, and references.

POSTSCRIPT PLOTFILE PACKAGE

The first digital data package (kla-map.ps.tar.gz) contains the PostScript images described below:

kla-sht1.ps	A PostScript plot file containing an image of the geologic map and base map of the Klamath Mountains and adjacent areas, including the correlation chart, at a scale of 1:500,000.
kla-sht2.ps	A PostScript plot file containing a description or the map units and references.
kla-sht3.ps	A PostScript plot file showing the sources of data.

DIGITAL DATABASE PACKAGE

The geologic map database consists of three layers and one base layer. Each of these layers (coverages) has been converted to uncompressed ARC/INFO export files. The ARC export files and the associated ARC/INFO coverages, as well as the additional digital material included in the database package, are described below:

ARC/INFO export file	Resultant Coverage	Description of Coverage
kla-geol.e00	kla-geol	Depositional contacts, faults, and unit labels
kla-pts.e00	kla-pts	Location of nickeliferous lateritic soils (point data)
kla-soils.e00	kla-soils	Location of nickeliferous lateritic soils (areal data)
kla-topo.e00	kla-topo	Topographic base map taken from a scan of portions of the Oregon and California state topographic maps.

ASCII text files and PostScript plot files:

kla-db.ps	This file
kla-db.txt	A text-only file containing an unformatted version of kla-db.ps
kla-geo.ps	A file containing geologic descriptions, references and sources of data
import.aml	ASCII text file in ARC Macro Language to convert these ARC export files to ARC coverages in ARC/INFO

The following directory is produced in the process of converting the export files into ARC coverages:

info/	INFO directory containing the database files that accompany each ARC/INFO layer (coverage).

Once the ARC export coverages have been imported (see discussion below), the Klamath Mountains (klamath) directory, or ARC workspace, will look like this:

```
klam/
        info/
        kla-geol/
        kla-pts/
        kla-soils/
        kla-topo/
        kla-db.ps
        kla-db.txt
        kla-geo.ps
        import.aml
```

OBTAINING PLOTS FROM AN OUTSIDE VENDOR

For those interested in the geology of the Klamath Mountains and adjacent areas who do not use computers, we have made the PostScript plot files available to Capitol Color, 2250 Walsh Ave., Santa Clara (phone: (800) 700-2656 or (408) 727-7560, FAX: (408) 727-0737). They will provide plots of the PostScript image of the geologic map sheet and explanation for a fee (around $25 per sheet, with discounts for orders of multiple copies). We will also provide the PostScript plot files on digital tape for use by other vendors. A 3.9 MB compressed tar file (kla-map.tar.gz, 15.3 MB when uncompressed) of the PostScript plot files can be obtained by sending a tape with request and return address to:

Klamath Mountains Geology PostScript Plotfile
c/o Database Coordinator
U.S. Geological Survey
345 Middlefield Road, MS 975
Menlo Park, CA 94025

The compressed tar file will be returned on the tape. The acceptable tape types are:
1/4 inch, 150 MB cartridge tape
2.3 or 5.0 GB, 8 mm Exabyte tape.

Make sure your vendor is capable of reading these tape types and PostScript plot files. Important information regarding tape file format is included in the section "PostScript Plot Files" below, so be certain to provide a copy of this document to your vendor.

POSTSCRIPT PLOTFILE PACKAGE

For those interested in the geology of Klamath Mountains and adjacent areas who don't use an ARC/INFO compatible GIS system, but would like to obtain the paper map with explanation, we have included a separate data package (klamap.ps.tar.gz) with three PostScript plot files, one representing the geologic data, one showing the sources of data, and a third which includes a geologic description and references.

This plot file package is available in any of the three ways described below, including the World Wide Web pages. The plot file package is stored in a compressed UNIX file requiring gzip to access the file. The plot file package was compressed with gzip, and may be uncompressed with gzip, which is available free of charge via the Internet from the gzip home page (http://w3.teaser.fr/~jlgailly/gzip).

The PostScript image of Sheet 1 is 30 inches wide by 32 inches high, so it requires a large plotter to produce paper copies at the intended scale. Because this release is primarily a digital database, the plot file (and plots derived therefrom) package has not been edited to conform to U.S. Geological Survey standards. Small units have not been labeled with leaders and in some instances map features or annotation may overlap. Sample plots by the authors, however, have proven to be quite legible and useful.

Obtaining the PostScript plotfile package

The PostScript plotfile package can be obtained in any of three ways:

1. Sending a tape with request.
A 3.9 MB compressed tar file of the plotfile and text can be obtained by sending a tape with request to:

Klamath Mountains Geology PostScript Plotfile
c/o Database Coordinator
U.S. Geological Survey
345 Middlefield Road, MS 975
Menlo Park, CA 94025

The compressed tar file will be returned on the tape. The acceptable tape types are:
1/4 inch, 150 MB cartridge tape
2.3 or 5.0 GB, 8 mm Exabyte tape.

2. Anonymous ftp over the Internet
To obtain the tar file by ftp, log in to your UNIX system and do the following:

cd local_directory	-go to a directory to receive the tar file
ftp wrgis.wr.usgs.gov	-make ftp connection with the USGS computer WRGIS
Name: anonymous	-use "anonymous" as your user name
Password: your name	-use your own user name as password
cd pub/open-file	-go down to the pub/open-file directory
cd of97-465	-go down to the open file directory
type binary	-change transfer type to binary
get kla-map.ps.tar.gz	-copy the compressed plot file across Internet to your directory
quit	-close the ftp connection

3. From the Western Region Geologic Information Web Page.

The U.S. Geological Survey now supports a set of graphical pages on the World Wide Web. Digital publications (including this one) can be accessed via these pages. The web server for digital publications from the Western Region is "http://wrgis.wr.usgs.gov". Once at the main page, click on 'Geologic Map Databases' under the heading 'Data Online'; next click on 'California.' Scroll down to the section for this database and click on the Open-File button to get to this publication's web page. Or go directly to this publication's web page: http://wrgis.wr.usgs.gov/open-file/of97-465. Set your web browser to save to a local disk and click on the link labeled 'kla-map.ps.tar.gz' to download the compressed tar file that contains the Klamath Mountains plot file package.

Extracting The PostScript Plotfile Package

1. If you obtained the plotfile package on tape:

put the tape in your tape drive	
cd local_directory	-go to a directory to receive the tar file

tar xvfb /dev/rstn 20	-/dev/rstn is the tape device with n being an integer, this puts the tar file in local_directory; 20 is the block size of the tar file
gzip -d kla-map.ps.tar.gz	-makes a 15.3 MB uncompressed tar file calley kla-map.tar
tar xvfb {path to tar file}/kla-map.ps.tar 20	-extract the kla-map directory from the tar file.

2. If you obtained the database by anonymous ftp or from the World Wide Web:

gzip -d kla-map.ps.tar.gz	-makes a 15.3 MB uncompressed tar file called kla-map.tar
tar xvfb {path to tar file}/kla-map.ps.tar 20	-extract the kla-map directory from the tar file.

OBTAINING THE DIGITAL DATA

The digital database package can be obtained in any of three ways:

1. Sending a tape with request

A 6.0 MB compressed tar file of the geologic map database and related files can be obtained by sending a tape with request and return address to:

Klamath Mountains Geologic Database
c/o Database Coordinator
U.S. Geological Survey
345 Middlefield Road, M/S 975
Menlo Park, CA 94025

The compressed tar file will be returned on the tape. The acceptable tape types are:

1/4 inch, 150 MB cartridge tape
2.3 or 5.0 GB, 8mm Exabyte tape.

2. Anonymous ftp over the Internet
To obtain the tar file by anonymous ftp do the following:

cd local_directory	go to a directory to receive the tar file
ftp wrgis.wr.usgs.gov	make ftp connection with the USGS computer WRGIS

Name: anonymous	use “anonymous” as your user name
Password: your email address	use your email address as a password
cd pub/geologic	go down to the pub/geologic directory
cd ca/of97-465	go down to the open file directory
type binary	change transfer type to binary
get klam.tar.gz	copy the compressed tar file across Internet to the receiving directory
quit	close the ftp connection

3. From the Western Region Geologic Information Web Page.

To obtain the tar file via the World Wide Web:

The U.S. Geological Survey now supports a set of graphical pages on the World Wide Web. Digital geologic publications (including this one) can be accessed via these pages. The web page for digital geologic publications from the Western Region (including this one) is “http://wrgis.wr.usgs.gov”. Once at the main page, click on 'Geologic Map Databases' under the heading 'Data Online'; next click on 'California.' Scroll down to get to the listing for this database. Click on 'Open-File Report 97-465'; this will take you to the web page for this database. Set your web browser to save to a local disk and click on the link labeled 'klam.tar.gz' to download the compressed tar file that contains the Klamath Mountains map database, or, select a single layer, layers or the PostScript plot file (kla-map.ps.tar.gz).

EXTRACTING THE GEOLOGIC MAP DATABASE FROM THE TAR FILE

If you obtained the database package on tape:

put the tape in your tape drive	
cd local_directory	-go to a directory to receive the tar file
tar xvfb /dev/rstn 20	-/dev/rstn is the tape device with n an integer, this puts the tar file in local_directory; 20 is the block size of the tar file
gzip -d klam.tar.gz	-makes a ?? MB uncompressed tar file klam.tar
cd local_directory2	-go to the directory that will hold the directory klam (if different from local_directory)

tar xvfb {path to tar file}/klam.tar 20	-extract the klam directory from the tar file; 20 is the block size of the tar file.

If you obtained the database package by anonymous ftp or from the web page:

gzip -d klam.tar.gz	-makes a ?? MB uncompressed tar file klam.tar
cd local_directory2	-go to the directory that will hold the directory klam (if different from local_directory)
tar xvfb {path to tar file}/klam.tar 20	-extract the klam directory from the tar file.

Each of the processes described above will create a directory "klam" that contains the ARC export files and supporting files as described below. The directory structure at thispoint will look like this:

```
klam/
    kla-geol.e00
    kla-pts.e00
    kla-soils.e00
    kla-topo.e00
    kla-db.ps
    kla-db.txt
    kla-geo.ps
    import.aml
```

CONVERTING ARC EXPORT FILES

ARC export files are converted to ARC coverages using the ARC command IMPORT with the option COVER. In order to ease conversion and to maintain naming conventions, we have included an ASCII text file in ARC Macro Language that will convert all of the export files in the database into coverages and create the associated INFO directory. Change directories to the klageo/ directory. From the ARC command line type:

Arc: &run import.aml

ARC export files can also be read by some other Geographic Information Systems. Please consult your GIS documentation to see if you can use ARC export files and the procedure to import them.

DIGITAL COMPILATION

The geologic map information was digitized from a stable original of the geologic map at 1:500,000 scale. The author manuscript (ink on a greenline) was scanned using a monochrome scanner with a resolution of 800 dots per inch. The scanned image was vectorized and transformed from scanner coordinates to projection coordinates with digitaltics placed by hand at latitude/longitude intersections. The scanned lines were edited interactively by hand using graphical user interface ALACARTE (Fitzgibbon, 1991, Fitzgibbon and Wentworth, 1991, Wentworth and Fitzgibbon, 1991). Scanning artifacts significant for display at a scale of 1:500,000 were corrected.

BASE MAP

The base map layer (kla-topo) was prepared by scanning a scale-stable clear film of a photo-mechanical of parts of the California and Oregon state topographic maps (scale = 1:750,000). The base map only contains the culture and drainage layers, contours are notincluded in this base layer. The clear film was scanned using a monochrome scanner with a resolution of 400 dots per inch. The raster scan was converted to a GRID in ARC/INFO. The GRID was then vectorized and reprojected into UTM Projection using the latitude/longitude intersections as reference points. The arcs in the base layer have not been attributed. The base map is provided for reference only.

SPATIAL RESOLUTION

Uses of this digital geologic map should not violate the spatial resolution of the data. Although the digital form of the data removes the constraint imposed by the scale of a paper map, the detail and accuracy inherent in map scale are also present in the digital data. The fact that this database was edited at a scale of 1:500,000 means that higher resolution information is not present in the dataset. Plotting at scales larger than 1:500,000 will not yield greater real detail, although it may reveal fine-scale irregularities below the intended resolution of the database. Similarly, where this database is used in combination with other data of higher resolution, the resolution of the combined output will be limited by the lower resolution of these data.

FAULTS

This database is not sufficiently detailed or comprehensive to identify or characterize site-specific hazards represented by faults shown; the faults shown do not take the place of fault-rupture hazard zones designated by the California State Geologist (see Hart, 1988).

DATABASE SPECIFICS

The map databases consist of ARC coverages which are stored in Lambert Conformal Conic projection (Table 1). Digital tics define a one degree grid of latitude and longitude in the geologic coverages.

Table 1 - Map Projection
The map is stored in Lambert Conformal Conic projection

PROJECTION LAMBERT	
UNITS METERS	-on the ground
DATUM NAD27	
PARAMETERS:	
1ST STANDARD PARALLEL	33 00 00
2ND STANDARD PARALLEL	45 00 00
CENTRAL MERIDIAN	-123 00 00
LATITUDE OF PROJECTION'S ORIGIN	00 00 00
FALSE EASTING	0.00
FALSE NORTHING	0.00

The content of the geologic database can be described in terms of the lines and the areas that compose the map. Descriptions of the database fields use the terms explained in Table 2.

Table 2 - Field Definition Terms

ITEM NAME	name of the database field (item)
WIDTH	maximum number of digits or characters stored
OUTPUT	output width
TYPE	B-binary integer, F-binary floating point number, I-ASCII integer, C-ASCII character string
N. DEC.	number of decimal places maintained for floating point numbers

LINES

The lines (arcs) are recorded as strings of vectors and are described in the arc attribute table (Table 3). They define the boundaries of the map units, faults, the boundaries of open bodies of water, ridge crests above and below 2000 meters and the map boundaries. These distinctions, including the geologic identities of the unit boundaries, are recorded in the LTYPE field according to the line types listed in Tables 4 and 5.

Table 3 - Content of the Arc Attribute Tables (KLA-GEOL.AAT, KLA-SOILS.AAT)

ITEM NAME	WIDTH	OUTPUT	TYPE	N. DEC	
FNODE#	4	5	B		starting node of arc (from node)
TNODE#	4	5	B		ending node of arc (to node)
LPOLY#	4	5	B		polygon to the left of the arc
RPOLY#	4	5	B		polygon to the right of the arc
LENGTH	4	12	F	3	length of arc in meters
<coverage>#	4	5	B		unique internal control number
<coverage>-ID	4	5	B		unique identification number
LTYPE	35	35	C		line type (see Tables 4 and 5)
SEL	1	1	I		user defined field used to save a selected set
SYMB	3	3	I		user defined field used to save symbol assignments (such as color)

Table 4 - Line Types Recorded in the LTYPE Field (KLA-GEOL)

contact, approx. located
contact, certain
fault, approx. located
fault, certain
fault, concealed
map boundary, certain
ridgecrestbelow2000m, certain
ridgecrestabove2000m, certain
scratch boundary, certain
water boundary, certain

Table 5 - Line Types Recorded in the LTYPE Field (KLA-SOILS)

scratch boundary

AREAS

Map units (polygons) are described in the polygon attribute table (Table 6) The identities of the map units from compilation sources are recorded in the PTYPE field by map label (Tables 7 and 8). For a full description of the map units, consult the accompanying geologic description (kla-geo.ps or kla-geo.txt).

Table 6 - Content of the Polygon Attribute Tables (KLA-GEOL.PAT, KLA-SOILS.PAT)

ITEM NAME	WIDTH	OUTPUT	TYPE	N. DEC	
AREA	4	12	F	3	area of polygon in square meters
PERIMETER	4	12	F	3	length of perimeter in meters
<coverage>#	4	5	B		unique internal control number
<coverage>-ID	4	5	B		unique identification number
PTYPE	35	35	C		unit label (see Tables 7 and 8)
SEL	1	1	I		user defined field used to save a selected set
SYMB	3	3	I		user defined field used to save symbol assignments (such as color)

Table 7 - Map Units (KLA-GEOL)

H2O	QTw	Qv	Tss
KJm	Qby	Qya	Tt
Kc	Qc	TKc	Tus
Kgv	Qf	Teh	Tv
Kh	Qg	Tg	Tvs
Kl	Qh	Ti	Tw

Ku	Qm	Tkp	Twi
Mu	Qms	Tmc	Ty
Pl	Qrb	Tms	cr
Pu	Qs	Ts	laterite
QTf	Qsc	Tsc	os
QTgb	Qt	Tsg	pn
QToa	Qth	Tsm	

Table 8 - Map Units (KLA-SOILS)

laterite

POINTS

Point information (locations where nickeliferous lateritic soils have developed) is recorded as coordinate and related information and is described in the Point Attribute Table (Table 9). The identities of point types recorded in the PTTYPE field of the KLA-PTS.PAT table are shown in Table 10.

Table 9 - Content of the Point Attribute Tables (KLA-PTS.PAT)

ITEM NAME	WIDTH	OUTPUT	TYPE	N. DEC	
AREA	4	12	F	3	not used
PERIMETER	4	12	F	3	not used
<coverage>#	4	5	B		unique internal control number
<coverage>-ID	4	5	B		unique identification number
PTTYPE	35	35	C		point type (see Table 9)
DIP	3	3	I		dip angle in degrees
STRIKE	3	3	I		strike angle in degrees
SEL	1	1	I		user defined field used to save a selected set
SYMB	3	3	I		user defined field used to save symbol assignments (such as color)

Table 10 - Map Units (KLA-PTS)

laterite

ACKNOWLEDGMENTS

I thank Carl Wentworth for providing the facilities and advice for the digital preparation of the map. Scott Graham who patiently assisted me in the digitization., and Gregg Beukelman and Scott Graham who prepared the documentation for the digital database.

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