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The Digital Coal Map of South America in ARC/INFO Format

by

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Open-File Report 95-235

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This data base, identified as OFR-95-235, The Digital Coal Map of South America in ARC/INFO Format, has been approved for release and publication by the Director of the USGS. Although this data base has been subjected to rigorous review and is substantially complete, the USGS reserves the right to revise the data pursuant to further analysis and review. Furthermore, it is released on condition that neither the USGS nor the United States Government may be held liable for any damages resulting from its authorized or unauthorized use.

In order to use this data base, ARC/INFO software and hardware and FTP software to copy the data base to the ARC/INFO platform are required. The data base can be downloaded via 'anonymous ftp' from a USGS system named greenwood.cr.usgs.gov (136.177.48.5). The files are located in a directory named /pub/open-file-reports/ofr-95-0235. To install the data base, type: &r LOAD.AML. To create the MAP COMPOSITION and ARC/INFO graphics file type: &r SAMER.AML (in ARC 6) or &r SAMER7.AML (IN ARC 7). When creating a plot file, use the opaque option.

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As a result of a Latin American Coal Assessment, the USGS has published the first Coal Map of South America (Weaver and Wood, 1994) and developed a cooperative inter-American exchange of geologic information which will lead to a better understanding of the potential for coal resource utilization in the western hemisphere. The need to understand the future energy mix of the world for global energy and environment decisions, prompted the creation of a Geographic Information System (GIS) data base of coal in South America. The digital map of Coal in South America and associated spatial data base creates an environment to display and query the current status of the data base, and to do coal assessments world wide. Knowledge of coal resources world wide will assist policy decisions on development of our resources and protection of fragile environments like rain forests.

The coal map was digitized from original film positives and ozalids of drafts used to prepare the published Coal Map of South America (Weaver and Wood, 1994). Consequently, the digital version is accurate at a scale of 1:7,500,000 using the Bipolar Oblique Conic Conformal projection and parameters of the base map. The stable base sheets were scanned on a Tektronix 4991 digital scanner. The scanner automatically converts the scanned image to an ASCII vector format. These vectors were transferred to a Data General workstation, where they were then loaded into ARC/INFO. Vectors and polygons were given attributes derived from the original 1994 coal map. The digital map was created by querying the associated spatial data base to assign and post the symbols defining age and rank of coal.

This data base was developed on a Data General Avion DG/UX computer system using USGS DG/UX 5.4.1 and ARC/INFO 6.1.1 software. The lineset and shadeset files are coded for a HP650c plotter. AML programs were copied and adjusted where necessary to work in ARC/INFO 7.0.2. Changes in the textset, lineset and shadeset formats in ARC/INFO version 7 prompted these adjustments that are contained in AML files designated by filenames that

end with 7.AML and are described as working in ARC 7. Apparently there's a bug in ARC/INFO 7.0.2 that causes the swamp shade symbol to plot incorrectly. When this was run in the final snapshot version of beta 7.0.3, it worked correctly. Other than the swamp shade symbol error, the programs work in ARC/INFO 7.0.2.

The digital data set is planned for publication as an interactive spatial data set with application software on a CD-ROM.

The authors wish to thank Roland Viger of the USGS for the digital review, and Carl Rich of the USGS for his ARC/INFO expertise and guidance.

Directory contents:

READ.ME	Text file that contains this Open-File 95-235 document.
APPENDIX	A list of all the ARCPLOT commands used to create a MAP COMPOSITION (ESRI, 1991) and a plot file of the digital Coal Map of South America in ARC/INFO format.
LOAD.AML	Converts ARC/INFO EXPORT format files into ARC/INFO coverages and INFO data bases.
SAMER.AML	Top level (driver) AML program that runs all the AML programs to create a MAP COMPOSITION (ESRI, 1991) and a plot file in ARC/INFO 6.1.1 of 'The Digital Coal map of South America in ARC/INFO format' from the data bases.
SAMER7.AML	SAMER.AML adjusted to work in ARC/INFO 7.0.2.
BEGIN.AML	Aml that provides preliminary arcplot information to create Coal Map of South America.
SA.AML	Arcplot commands that draw the lines and symbols in ARC/INFO 6.1.1.
SA7.AML	SA.AML adjusted to work in ARC/INFO 7.0.2.
MAP.AML	Arcplot commands that label countries, watersheds and other features in ARC/INFO 6.1.1.
MAP7.AML	MAP.AML adjusted to work in ARC/INFO 7.0.2.
LAB.AML	Arcplot commands that draw leaders, queries, scale bar, map explanations and title.
SOUTHAM.E00	Polygons that define the continental boundary of South America.
BACKGRND.E00	Polygons that define area for shading oceans light blue.
LLDENS.E00	Lines and text for the latlong graticule.
COA_PNK.E00	Polygons that define areas of potential coal occurrence with no age designation.
COA_BRN.E00	Polygons that define areas of potential coal occurrence designated Tertiary and Cretaceous age.
COA_GRN.E00	Polygons that define areas of potential coal occurrence designated Jurassic age.
COA_MVE.E00	Polygons that define areas of potential coal occurrence designated Tertiary age.
COA_ORG.E00	Polygons that define areas of potential coal occurrence designated Cretaceous age.

COA_PRP.E00 Polygons that define areas of potential coal occurrence designated Carboniferous age.

SED.E00 Polygons that define sedimentary basins in South America.

COA.E00 Lines that define areas of potential coal occurrence.

CF.E00 Polygons that define coal fields in South America.

SALAR.E00 Polygons that define salars in South America.

SWAMPS.E00 Polygons that define swamps in South America.

DRAIN.E00 Lines that define the drainage system in South America.

COUNTRY.E00 Lines that define country borders in South America.

COALOCC.E00 Points that define the coal data point locations.

SCALE.E00 Lines and text for the scale bar.

ID.REL.E00 Info file that stores the Relate between the coal data point locations (COALOCC.E00) and the COAL_TABLES.E00 data base.

COAL_TABLES.E00 Data base of coal occurrences in South America.

AGERNK.MRK ARC/INFO markerset, the palette of coal occurrence symbols.

PARENTH.MRK ARC/INFO markersymbol created for blowup area west of Peru.

COLOR10.LIN ARC/INFO lineset, a palette of line types for the plotter.

SWAMP.SHD ARC/INFO 6.1.1 shadeset pattern for swamps.

SWAMP7.SHD ARC/INFO 7 shadeset pattern for swamps.

FNT031 ARC/INFO coal age and rank symbols font file.

FNT032 ARC/INFO explanation symbols font file.

SAMER.HP Plot file of 'The Digital Coal map of South America in ARC/INFO format' for the HP650c plotter.

Arcplot key files that create the explanations:

AGE.KEY	Age of coal occurrences in the explanation.
SED.KEY	Sedimentary basin in explanation.
CF.KEY	Coal basin text in explanation.
CF2.KEY	Coal basin line in explanation.
COALOCC.KEY	Area of potential coal occurrence in explanation.
CLOCCLN.KEY	Outline of area of potential coal occurrence in the explanation.
COOP.KEY	Cooperators.
RANK.KEY	Rank in explanation.

Extra files (not used in MAP COMPOSITION):

CTryp.E00 Polygon coverage of country borders and South America continental boundary with country identification attributes. (Differs from COUNTRY.E00 in that the lines were combined with SOUTHAM.E00 to create polygons for attributing purposes. Used for GIS querying by country.)

PROJ.BO2LL Project conversion file for bipolar oblique to geographic.

CODING SCHEME FOR THE DATA BASE TABLE:

The coal data included in TABLES in the pamphlet that accompanies Coal Investigations Map C-145, were imported into INFO as a spatial data base that supplies data for the digital map. It is related to the coverage defining coal data point locations (COALOCC.E00) using the ARC/INFO Relate command, which allows the data base to define the symbology for age and rank of coal. Because many of the values for numeric items are ranges of data rather than single values for any given coal data point location (i.e.: ash (%) of 45.00-60.00), many of the numeric fields had to be defined as character fields. Additional fields were added to redefine these fields as numeric fields so that statistical analyses can be utilized in the GIS. Following is an example of the spatial data base in INFO, with explanations of each item in the INFO file and of the codes used to flag the numeric fields.

Example of INFO data base (COAL_TABLES.E00)

```

1
I-A-A      =Rio Grande Do Sul
MAP#       =1
CF-O-MN    =Mina Seival
OPER       =CNMC
MINET      =S
REC-ACT    =n.a.
AGE        =Perm.
RANK       =sub.
#BEDS      = 5
ASH%       =51.0
SULFUR%    =1.14
VOL-MAT%   =22.11
MOIST%     =n.a.
HEATV      =3,322
ID         = 1.0
#BEDSI     = 5.0
ASHMN+     =51.00
ASHMX      =-8.88
SULFMAX    =-8.88
SULFMN     = 1.140
VOLMAX     =-8.88
VOLMN+     =22.110
MOISMN+    =-9.99
MOISMX     =-9.99
HVMN+      =3,322.0
HVMX       =-8888.8

```

```

2
I-A-A      =Rio Grande Do Sul
MAP#       =2
CF-O-MN    =Mina Hula Negra
OPER       =n.a.
MINET      =S
REC-ACT    =n.a.
AGE        =Perm.
RANK       =sub.
#BEDS      =?
ASH%       =?
SULFUR%    =n.a.
VOL-MAT%   =n.a.
MOIST%     =n.a.
HEATV      =n.a.
ID         = 2.0
#BEDSI     = 0.7

```

ASHMN+	=-7.77
ASHMX	=-7.77
SULFMAX	=-9.99
SULFMN	=-9.999
VOLMAX	=-9.99
VOLMN+	=-9.999
MOISMN+	=-9.99
MOISMX	=-9.99
HVMN+	=-9999.9
HVMX	=-9999.9

3

I-A-A	=Rio Grande Do Sul
MAP#	=3
CF-O-MN	=Mina Candiota
OPER	=CRM
MINET	=S
REC-ACT	=n.a.
AGE	=Perm.
RANK	=sub.
#BEDS	=10
ASH%	=52.20
SULFUR%	=1.7
VOL-MAT%	=21.00
MOIST%	=11.30
HEATV	=3,230
ID	= 3.0
#BEDSI	=10.0
ASHMN+	=52.20
ASHMX	=-8.88
SULFMAX	=-8.88
SULFMN	= 1.700
VOLMAX	=-8.88
VOLMN+	=21.000
MOISMN+	=11.30
MOISMX	=-8.88
HVMN+	=3,230.0
HVMX	=-8888.8

ITEM FEATURE (as defined in Coal Investigations Map C-145 pamphlet)

I-A-A	Internal administrative area
MAP#	Map number
CF-O-MN	Coal Field, occurrence/mine name
OPER	Operator
MINET	Mine type
REC-ACT	Recovery activity
AGE	Age
RANK	Rank
#BEDS	Number of beds
ASH%	Ash(%)
SULFUR%	Sulfur(%)
VOL-MAT%	Volatile matter(%)
MOIST%	Moisture(%)
HEATV	Heat value (kcal/kg)
ID	Common item for Relate between COALOCC.E00 and COAL_TABLES.E00

