Bibliography of Borehole Geophysics as Applied to Ground-Water Hydrology
Bibliography of Borehole Geophysics as Applied to Ground-Water Hydrology

By Ticie A. Taylor and Joyce A. Dey

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1985
# CONTENTS

<table>
<thead>
<tr>
<th>Page</th>
<th>Subject Headings—Continued</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Abstract</td>
</tr>
<tr>
<td>1</td>
<td>Introduction</td>
</tr>
<tr>
<td>2</td>
<td>Acknowledgements</td>
</tr>
<tr>
<td>2</td>
<td>Subject Headings</td>
</tr>
<tr>
<td>2</td>
<td>Acoustic</td>
</tr>
<tr>
<td>5</td>
<td>Acoustic televiewer</td>
</tr>
<tr>
<td>5</td>
<td>Acoustic waveforms</td>
</tr>
<tr>
<td>6</td>
<td>Artificial recharge</td>
</tr>
<tr>
<td>7</td>
<td>Borehole geophysics, general</td>
</tr>
<tr>
<td>11</td>
<td>Borehole geophysics, logging texts</td>
</tr>
<tr>
<td>12</td>
<td>Calibration</td>
</tr>
<tr>
<td>12</td>
<td>Caliper</td>
</tr>
<tr>
<td>12</td>
<td>Carbonates</td>
</tr>
<tr>
<td>12</td>
<td>Casing and cement bond logs</td>
</tr>
<tr>
<td>13</td>
<td>Coal</td>
</tr>
<tr>
<td>13</td>
<td>Computer analysis</td>
</tr>
<tr>
<td>16</td>
<td>Core</td>
</tr>
<tr>
<td>17</td>
<td>Cross plotting</td>
</tr>
<tr>
<td>17</td>
<td>Dielectric measurements</td>
</tr>
<tr>
<td>17</td>
<td>Digitizing logs</td>
</tr>
<tr>
<td>18</td>
<td>Dipmeter</td>
</tr>
<tr>
<td>18</td>
<td>Directional survey</td>
</tr>
<tr>
<td>18</td>
<td>Elastic moduli</td>
</tr>
<tr>
<td>18</td>
<td>Electromagnetics</td>
</tr>
<tr>
<td>18</td>
<td>Flowmeters</td>
</tr>
<tr>
<td>19</td>
<td>Fluid conductivity and resistivity</td>
</tr>
<tr>
<td>20</td>
<td>Formation factor</td>
</tr>
<tr>
<td>20</td>
<td>Fractures</td>
</tr>
<tr>
<td>21</td>
<td>Gamma</td>
</tr>
<tr>
<td>21</td>
<td>Gamma-gamma</td>
</tr>
<tr>
<td>22</td>
<td>Gamma spectral</td>
</tr>
<tr>
<td>24</td>
<td>Geopressure</td>
</tr>
<tr>
<td>27</td>
<td>Geothermal</td>
</tr>
<tr>
<td>29</td>
<td>Gravimeter, borehole</td>
</tr>
<tr>
<td>29</td>
<td>Ground-water applications</td>
</tr>
<tr>
<td>30</td>
<td>Guard log</td>
</tr>
<tr>
<td>30</td>
<td>Hydraulic fracturing</td>
</tr>
<tr>
<td>31</td>
<td>Igneous and metamorphic rocks</td>
</tr>
<tr>
<td>31</td>
<td>Induced polarization</td>
</tr>
<tr>
<td>32</td>
<td>Induction</td>
</tr>
<tr>
<td>32</td>
<td>Injectivity profile</td>
</tr>
<tr>
<td>32</td>
<td>Interpretation manuals</td>
</tr>
<tr>
<td>32</td>
<td>Lithology and thickness</td>
</tr>
<tr>
<td>33</td>
<td>Logging while drilling</td>
</tr>
<tr>
<td>33</td>
<td>Magnetic</td>
</tr>
<tr>
<td>33</td>
<td>Mineral exploration by logging</td>
</tr>
<tr>
<td>33</td>
<td>Moisture content</td>
</tr>
<tr>
<td>34</td>
<td>Neutron</td>
</tr>
<tr>
<td>34</td>
<td>Neutron activation</td>
</tr>
<tr>
<td>37</td>
<td>Nuclear magnetic resonance</td>
</tr>
<tr>
<td>39</td>
<td>Oil shale</td>
</tr>
<tr>
<td>39</td>
<td>Permafrost</td>
</tr>
<tr>
<td>40</td>
<td>Permeability</td>
</tr>
<tr>
<td>40</td>
<td>Petroleum production</td>
</tr>
<tr>
<td>41</td>
<td>Porosity</td>
</tr>
<tr>
<td>42</td>
<td>Pressure measurements</td>
</tr>
<tr>
<td>42</td>
<td>Programs for well log analyses for hand-held calculators</td>
</tr>
<tr>
<td>42</td>
<td>Pulsed neutron</td>
</tr>
<tr>
<td>43</td>
<td>Radar</td>
</tr>
<tr>
<td>44</td>
<td>Redox logging</td>
</tr>
<tr>
<td>44</td>
<td>Resistivity</td>
</tr>
<tr>
<td>46</td>
<td>Saline water problems</td>
</tr>
<tr>
<td>46</td>
<td>Shale and clay effects</td>
</tr>
<tr>
<td>47</td>
<td>Spontaneous potential</td>
</tr>
<tr>
<td>47</td>
<td>Statistical methods</td>
</tr>
<tr>
<td>48</td>
<td>Stress measurements</td>
</tr>
<tr>
<td>48</td>
<td>Subsidence</td>
</tr>
<tr>
<td>48</td>
<td>Television</td>
</tr>
<tr>
<td>48</td>
<td>Temperature</td>
</tr>
<tr>
<td>50</td>
<td>Tracers</td>
</tr>
<tr>
<td>51</td>
<td>Waste disposal, general</td>
</tr>
<tr>
<td>52</td>
<td>Waste disposal, radioactive</td>
</tr>
<tr>
<td>53</td>
<td>Water saturation</td>
</tr>
<tr>
<td>53</td>
<td>References cited</td>
</tr>
<tr>
<td>55</td>
<td>Author index</td>
</tr>
</tbody>
</table>

III
BIBLIOGRAPHY OF BOREHOLE GEOPHYSICS AS APPLIED TO GROUND-WATER HYDROLOGY

By T. A. Taylor and J. A. Dey

ABSTRACT

Most of the references on borehole geophysics that are relevant to ground-water hydrology are contained in this bibliography, but it does not include every reference that is available under each subject heading; the literature is much too extensive to compile a complete listing.

Some of the references may appear under more than one subject heading because the references commonly relate to more than one main topic. Many articles have been cross-referenced in order to assist the reader in locating an article. For example, the article entitled, "Application of the acoustic televiewer to the characterization of hydraulic fractures in geothermal wells" is listed under both "Acoustic televiewer," and "Geothermal".

The bibliography is intended to lead the reader to other articles on borehole-geophysical logging and related subjects, because each article cited also will have a list of references, which may be more specialized, covering many subjects with related applications, such as physics, mathematics, chemistry, geology, electronics, acoustics, hydrology, and surface geophysics. However, not all of these related subject headings could be included in this bibliography.

INTRODUCTION

A bibliography was developed to help Earth scientists who were having difficulty in locating and obtaining adequate information on borehole geophysics as applied to ground-water hydrology. Because many of the articles on this broad subject are published in technical journals or proceedings/transactions that have a limited distribution, a system to categorize these publications for easy referral was developed. The U.S. Geological Survey has been developing this listing for 20 years for agency use, but the numerous requests for copies of the listing made it imperative that it be published.

The original listings subsequently have been entered into a computer, which makes it easier to modify and update by adding new articles as they become available. Furthermore, a user can quickly obtain a listing of references on a specific topic, or by a specific author, without searching through hundreds of pages of reference listings. Because this bibliography is stored in a computer, it can and will be updated as the need occurs.

The organization is for the users' convenience. Subject headings, as listed in the table of contents, comprise the main divisions of the publication. Author citations are listed alphabetically under each subject, giving complete title and publication data. The subject headings primarily deal with the principal method of well logging or the dominant application of the publication within the broad field of ground-water hydrology, such as waste disposal, geothermal, and oil shale, or both. An author index for the papers cited has been included at the end of this publication, as a further aid to the user.

No specific time period was established for articles to be included, but a cutoff date of July 1983 was necessary. Nor do the articles have a geographic boundary—many of the articles have been written by authors world-wide. Most of these articles are in English, or have been translated into English. However, a few articles in the original French were included, which have not been formally translated, but have been indicated by placing the label "(French)" in the listing.

The large volume of published material currently available makes it impossible for any one individual or small group to review and list all publications related to borehole geophysics as applied to ground-water hydrology. Other, professional, retrieval methods such as abstracting and indexing of journal articles (U.S. Department of Commerce, 1981) and developing computer-based storage and retrieval systems (University of Tulsa, 1983) are additional tools for meeting this need.
ACKNOWLEDGEMENTS

Many people contributed to this bibliography; special thanks is due W. Scott Keys, Chief, Borehole Geophysics Research Project, for his many contributions, suggestions, corrections, and support. Pat Salwerowicz and Robin Simpson also deserve credit and recognition for their help in computer processing and updating.

SUBJECT HEADINGS

ACOUSTIC


ACOUSTIC TEEVIEWER


ACOUSTIC WAVEFORMS


Nations, J. F., 1974, Lithology and porosity from acoustic shear and compressional wave transit time relationships: Log Analyst, v. 15, no. 6, p. 3-8.


ARTIFICIAL RECHARGE


Schneider, A. D., Jones, O. R., and Signor, D. C., 1971, Recharge of turbid water to the Ogallala aquifer through a dual-purpose well: College Station, Tex., Texas A & M University, Texas Agricultural Experiment Station Publication MP-1001, 10 p.

Signor, D. C., and Hauser, V. L., 1968, Artificial ground water recharge through basins in the Texas High Plains: College Station, Tex., Texas A & M University, Texas Agricultural Experiment Station Publication MP-885, 8 p.

BOREHOLE GEOPHYSICS, GENERAL

Aguilera, Roberto, 1979, Uncertainty in log calculations can be measured: Oil and Gas Journal, v. 77, no. 37, p. 128–129.


1964, Geophysical well logging: Neftyanoye Khzyayastvo (Petroleum Economy), v. 42, no. 9–10, p. 121–123.


______, 1966, Oil finding by systematic well log analysis: Log Analyst, v. 6, no. 5, p. 4–17.


**BOREHOLE GEOPHYSICS, LOGGING TEXTS**


**CALIBRATION**

American Petroleum Institute, 1963, Recommended practice for standard calibration and form for nuclear logs (2d ed.): Dallas, Tex., Division of Production, Publication API RP 33, 12 p.


**CARBONATES**


**CASING AND CEMENT BOND LOGS**


COAL


COMPUTER ANALYSIS


**CORE**


Granberry, R. J., and Wilshusen, R. C., 1962, Improved interpretation of formation productivity by combined use of core analysis and electric log data: Gulf Coast Association of Geological Societies Transactions, v. 12, p. 213–221.


CROSS PLOTTING


DIELECTRIC MEASUREMENTS


DIGITIZING LOGS


Work, P. L., Simmons, R. W., and Foster, J. T., 1976, Digitized logs evaluate data in raw form from existing fields to show reservoir parameters: Oil and Gas Journal v. 74, no. 6, p. 63-64.


DIPMETER


DIRECTIONAL SURVEY


ELECTRIC MODULI


Myung, J. I., and Helander, D. P., 1972, Correlation of elastic moduli dynamically measured by in-situ and laboratory techniques: Log Analyst, v. 13, no. 6, p. 22-33.

ELECTROMAGNETICS


FLOWMETERS

FLUID CONDUCTIVITY AND RESISTIVITY


FORMATION FACTOR


FRACTURES


Denoo, Stan, 1978, Several ways exist for locating reservoir fractures: Oil and Gas Journal, v. 76, no. 41, p. 80-82.


GAMMA


**GAMMA-GAMMA**


Andressy, Laszlo, 1980, Approximate graphical and numerical determination of densities corrected for borehole diameter: Geofizikai Kozlemenyek, no. 26, p. 79–88, issued by the University of Pisa, Petroleum Abstract no. 313,586.


Taylor, Denis, and Kansara, Mohan, 1966, Measuring density with the nuclear back-scatter method: Nucleonics, v. 24, no. 6, p. 54-56.


**GAMMA SPECTRAL**


Schimschak, Ulrich, 1980, Quantitative effects of lithology, borehole environment, and probe design in gamma spectral logging with scintillation crystals: Log Analyst, v. 21, no. 5, p. 3-10.


**GEOPRESSURE**


**GEOThERMAL**


**GRAVIMETER, BOREHOLE**


Rasmussen, N. F., 1975, Borehole gravimeter finds bypassed oil: Gas, Oil and Gas Journal, v. 73, no. 39, p. 100–104.


**GROUND-WATER APPLICATIONS**


1976, Hydrogeophysical properties of parts of the British Trias: Geophysical Prospecting, v. 24, no. 4, p. 672–695.


GUARD LOG


HYDRAULIC FRACTURING


IGNEOUS AND METAMORPHIC ROCKS


INDUCED POLARIZATION


INDUCTION


### INJECTIVITY PROFILE


### INSTRUMENTATION


### INTERPRETATION MANUALS


1982, Open hole log analysis: Fort Worth, Tex., Wireline Services Division, 136 p.


### LITHOLOGY AND THICKNESS


LOGGING WHILE DRILLING


Oil and Gas Journal, 1978, Majors do basic research on MWD, pt. 9 of Measurements while drilling—State of the art: v. 76, no. 36, p. 63-64.

_1978, Acoustic, EM systems due in 1979, conclusion of Measurements while drilling—State of the art: v. 76, no. 36, p. 119-123.


MAGNETIC


MINERAL EXPLORATION BY LOGGING


Czubek, J. A., 1971, Recent Russian and European developments in nuclear geophysics applied to mineral exploration and mining: Log Analyst, v. 12, no. 6, p. 20-34.


MOISTURE CONTENT

Atkinson, Asher, 1971, A method to determine the in-situ content of alluvium and tuff formations at the Nevada Test Site: Tulsa, Okla., Seismograph Service Corp., Birdwell Division, 8 p.


NEUTRON


———1965, Checking the calibration of nuclear soil moisture and density measuring equipment: Columbus, Ohio, U.S. Forest Service Research Note CS–31, 4 p.


NEUTRON ACTIVATION


Landstrom, Ove, Christell, Roland, and Koski, Keijo, 1972, Field experiments on the application of neutron activation techniques to in situ borehole analysis: Geoeexploration, v. 10, no. 4, p. 22-29.


Wainerdi, R. E., and Fite, L. E., 1964, Activation analysis
as applied to the petroleum industry: Society of Profes-
sional Well Log Analysts Annual Logging Symposium,

Wichmann, P. A., 1971, Neutron activation for elemental de-
10-18.

calculations for direct uranium measurement with neu-
trons: U.S. Energy Research and Development Admin-
istration, issued by the U.S. Department of Commerce,
National Technical Information Service, Report GJBX-
44(77), 114 p.

NUCLEAR MAGNETIC RESONANCE

Artus, D. S., 1969, Nuclear magnetism log can find porosity,

Brown, R. S., and Neuman, C. H., 1982, The nuclear magnet-
ism log—A guide for field use: Log Analyst, v. 23, no.
5, p. 4-9.

Cook, J. C., 1977, Electromagnetic resonance borehole assay
logging: U.S. Bureau of Mines Open-File Report 69-78,
99 p.

Gamson, B. W., and others, 1964, Nuclear magnetism logging
2, p. 150-156.

Gulyyev, C., 1966, An apparatus for measuring the moisture
content of rocks by nuclear magnetic resonance: Raz-
vodochnaya i Promyslovaya Geofizika, no. 10, p. 122-129,
issued by Menlo Park, Calif. Addis Translations Interna-
tional, UCRL-Translation 10105, 12 p.

Herrick, R. C., Couturie, S. H., and Best, D. L., 1979, An
improved nuclear magnetism logging system and its ap-
lication to formation evaluation: Society of Petroleum En-
gineers of the American Institute of Mining, Metallurgical,
and Petroleum Engineers Paper SPE 8861, 7 p.

Jackson, A. J., 1980, New NMR well logging/fracture mapping
technique with possible application of squid NMR detec-
tion: Los Alamos Scientific Laboratory, issued by the U.S.
Department of Commerce, National Technical Information

 mote characterization of tight gas formations with a new
NMR logging tool: Society of Petroleum Engineers of the
American Institute of Mining, Metallurgical, and Petroleum
Engineers/Department of Energy Low Permeability

Loren, J. D., 1972, Permeability estimates from NML mea-
8, p. 923-928.

Neuman, C. H., and Brown, R. S., 1981, Applications of nu-
clear magnetism logging to formation evaluation: Society of
Petroleum Engineers of the American Institute of Mining,
Metallurgical, and Petroleum Engineers Paper SPE 10106,
10 p.

Timur, Aytek, 1969, Pulsed nuclear magnetic resonance studies
of porosity, movable fluid, and permeability of sandstones:
Journal of Petroleum Technology, v. 21, no. 6, p. 775-786.

Timur, Aytek, Hempkins, W. B., and Massey, G. R., 1971,
Analysis of sidewall samples by nuclear magnetic reso-
nance methods: Society of Professional Well Log Analysts
Annual Logging Symposium, 12th, Dallas, Tex., 1971,
Transactions, p. T1-T21.

WYMAN, R. E., 1962, Nuclear magnetism log field test results:
Society of Professional Well Log Analysts Annual Logging

OIL SHALE

shales by log analysis: Journal of Petroleum Technology,
v. 15, no. 1, p. 81-84.

Chancellor, R. E., Barkdale, W. L., and Dolezal, George, Jr.,
1974, Occurrence of oil and gas in the Tertiary system,
Rio Blanco Unit, Rio Blanco County, Colorado, in Guide-
book to energy resources of the Piceance basin, Colo-
rado: Rocky Mountain Association of Geologists, p. 225-
234.

shales in Colorado core hole no. 1, Piceance Creek basin,
Colorado, in Guidebook to energy resources of the Piceance basin, Colorado: Denver, Rocky Mountain
Association of Geologists, p. 91-100.

Weeks, J. B., and others, 1974, Simulated effects of oil-shale
development on the hydrology of Piceance basin, Colorado:

Weeks, J. B., and Welder, F. A., 1974, Hydrologic and
geophysical data from the Piceance basin, Colorado: Colo-
rado Water Resources Basic-Data Release no. 35, 121 p.

Wolff, R. G., and others, 1974, Tectonic stress determination,
northern Piceance Creek basin, Colorado, in Guidebook
to energy resources of the Piceance basin, Colorado: Den-
ver, Rocky Mountain Association of Geologists, p. 193-
198.

PERMAFROST

Brown, Jerry, and Gray, Shelton, 1968, Geophysical aspects
of permafrost: U.S. Army Material Command, Terrestrial
Sciences Center, Cold Regions Research and Engineering
Laboratory Internal Report 60, 50 p.

in permafrost: Society of Professional Well Log Analysts
Annual Logging Symposium, 8th, Denver, Colo., 1967,
Transactions, p. N1-N27.

on geophysical logs and borehole temperature measure-
ments from the Muskox drilling project, in Drilling for
scientific purposes—International Upper Mantle Sym-
posium, Ottawa, 1965, Report: Geological Survey of

Howell, E. P., Seth, M. S., and Perkins, T. K., 1972, Temper-
ature calculations for wells which are completed through
permafrost: Society of Petroleum Engineers of the Ameri-
can Institute of Mining, Metallurgical, and Petroleum En-
gineers Paper SPE 3969, 12 p.

39


PERMEABILITY


PETROLEUM PRODUCTION


POROSITY


**PRESSURE MEASUREMENTS**


**PROGRAMS FOR WELL LOG ANALYSES FOR HAND-HELD CALCULATORS**


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**PULSED NEUTRON**


Soudier, W. W., and Williams, J. S., 1979, Interactive calculators can aid wellsite log analysis: Oil and Gas Journal, v. 77, no. 48, p. 69–70, 75, 79.


Soudier, W. W., and Williams, J. S., 1979, Interactive calculators can aid wellsite log analysis: Oil and Gas Journal, v. 77, no. 48, p. 69–70, 75, 79.


**PULSED NEUTRON**


**REDOX LOGGING**


**RESISTIVITY**


Doll, H. G., and Martin, M. 1964, How to use electrical log data to determine maximum producible oil index: Oil and Gas Journal, v. 53, no. 9, p. 120–126.


__1966, Interpretation of electric and gamma ray logs in water wells: Log Analyst, v. 6, no. 5, p. 29–44.


Jones, P. H., and Buford, T. B., 1951, Electric logging applied to ground-water exploration: Geophysics, v. 16, no. 1, p. 115–139.


SALINE WATER PROBLEMS


SALINE WATER PROBLEMS


SHALE AND CLAY EFFECTS


**SPONTANEOUS POTENTIAL**


1973, Deformations of natural electric fields near drainage structures: Geophysical Prospecting, v. 21, no. 4, p. 710–723.


**STATISTICAL METHODS**


**STRESS MEASUREMENTS**


**SUBSIDENCE**


**TELEVISION**


**TEMPERATURE**


Guyod, Hubert, 1946, Temperature well-logging, pt. 1—Heat conduction; pt. 2—Salt intrusions; pt. 3—Temperature distribution in the ground; pt. 4—Wells in thermal equilibrium; pt. 5 and 6—Wells not in thermal equilibrium, A, rotary holes; pt. 7—Conclusion: Oil Weekly, v. 128, no. 8, p. 35-39; no. 9, p. 38-42; no. 10, p. 33-38; no. 11, p. 50-53; v. 124, no. 1, p. 26-30, 32-34; no. 2, p. 36-40; no. 3, p. 38-40.


Parker, J. D., 1971, Basics of thermal conductivity, specific heat: Oil, Gas and Petrochemistry Equipment, v. 17, no. 11, p. 4-5.


Van Orstrand, C. E., 1951, Apparatus for the measurements of temperatures in deep wells, and temperature determinations in some deep wells in Pennsylvania and West Virginia, in Rege, D. B., and Teets, D. D., Jr., eds., West Virginia Geological Survey County Reports of Barbour and Upshur Counties and western portion of Randolph County: West Virginia Geological Survey, p. 61, 62, 86.


TRACERS


WASTE DISPOSAL, GENERAL


WATER SATURATION


REFERENCES CITED


## AUTHOR INDEX

<table>
<thead>
<tr>
<th>Author</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aamodt, R. L.</td>
<td>21, 27</td>
</tr>
<tr>
<td>Abulnaye, D.</td>
<td>27</td>
</tr>
<tr>
<td>Abeele, R.</td>
<td>24</td>
</tr>
<tr>
<td>Abu-Sayed, A. S.</td>
<td>11, 46</td>
</tr>
<tr>
<td>Acevedo, L.</td>
<td>20</td>
</tr>
<tr>
<td>Adams, J. A. S.</td>
<td>4</td>
</tr>
<tr>
<td>Adams, W. M.</td>
<td>12, 44</td>
</tr>
<tr>
<td>Adorni, N.</td>
<td>29</td>
</tr>
<tr>
<td>Adams, W. M.</td>
<td>29</td>
</tr>
<tr>
<td>Ainsworth, S.</td>
<td>48</td>
</tr>
<tr>
<td>Anderson, R. A.</td>
<td>23</td>
</tr>
<tr>
<td>Anderson, A.</td>
<td>46</td>
</tr>
<tr>
<td>Anderson, J. V.</td>
<td>46</td>
</tr>
<tr>
<td>Anderson, R.</td>
<td>51</td>
</tr>
<tr>
<td>Anderson, R. A.</td>
<td>2, 4</td>
</tr>
<tr>
<td>Anderson, R. N.</td>
<td>5</td>
</tr>
<tr>
<td>Anderson, T.</td>
<td>13</td>
</tr>
<tr>
<td>Anderson, W. B.</td>
<td>24, 44</td>
</tr>
<tr>
<td>Andrus, L.</td>
<td>22</td>
</tr>
<tr>
<td>Anglin, F. M.</td>
<td>34</td>
</tr>
<tr>
<td>Ansell, K. H.</td>
<td>34</td>
</tr>
<tr>
<td>Anth, S.</td>
<td>36, 43</td>
</tr>
<tr>
<td>Antia, H.</td>
<td>41</td>
</tr>
<tr>
<td>Apparno, A.</td>
<td>46</td>
</tr>
<tr>
<td>Archuleta, J. R.</td>
<td>27</td>
</tr>
<tr>
<td>Arditty, P. C.</td>
<td>2</td>
</tr>
<tr>
<td>Arena, G.</td>
<td>2</td>
</tr>
<tr>
<td>Ariasian, A.</td>
<td>10</td>
</tr>
<tr>
<td>Barkadyev, E. A.</td>
<td>32</td>
</tr>
<tr>
<td>Arkfeld, T. E.</td>
<td>3</td>
</tr>
<tr>
<td>Arney, B.</td>
<td>28</td>
</tr>
<tr>
<td>Arnold, D. M.</td>
<td>34, 50, 51</td>
</tr>
<tr>
<td>Arnold, J. S.</td>
<td>18</td>
</tr>
<tr>
<td>Arnould, E. B., Jr.</td>
<td>39</td>
</tr>
<tr>
<td>Artiges, R.</td>
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