

ERRATUM • **OPEN ACCESS**

Erratum: Combined fit of spectrum and composition data as measured by the Pierre Auger Observatory

To cite this article: JCAP03(2018)E02

View the [article online](#) for updates and enhancements.



IOP | ebooks™

Bringing together innovative digital publishing with leading authors from the global scientific community.

Start exploring the collection—download the first chapter of every title for free.

Erratum: Combined fit of spectrum and composition data as measured by the Pierre Auger Observatory

The Pierre Auger collaboration

E-mail: auger_spokespersons@fnal.gov

Received February 26, 2018

Accepted February 27, 2018

Published March 5, 2018

Erratum to: [JCAP04\(2017\)038](#)

ArXiv ePrint: [1612.07155](#)

JCAP03(2018)E02



Contents

1	Parameters of vertical SD energy bias	1
2	Parameterization of inclined SD energy resolution	1
	The Pierre Auger collaboration	2

1 Parameters of vertical SD energy bias

In the original article, there were typographical errors in the values of the parameters in eq. (B.5). The correct values are $P_0 = 0.0566$, $P_1 = -0.0720$, $P_2 = 0.0227$.

2 Parameterization of inclined SD energy resolution

The original article incorrectly stated that the folding procedure for the inclined spectrum was fully described in ref. [68], which actually only contains a qualitative discussion. The parameterizations we used for the trigger efficiency $\mathcal{T}$, the energy bias b and the energy resolution σ_E/E were: $\mathcal{T} = 1$; $b = 1$; and

$$\sigma_E/E = \sqrt{\sigma_{\text{det}}^2 + \sigma_{\text{sh}}^2}/c_1, \text{ where } \sigma_{\text{det}} = p_0 + \frac{p_1}{\sqrt{c_0(E/10 \text{ EeV})^{c_1}}}, \quad \sigma_{\text{sh}} = 0.143, \quad (2.1)$$

with $p_0 = 0.03896$, $p_1 = 0.1128$ and $c_0 = 1.746$, $c_1 = 0.9938$.

The Pierre Auger collaboration

A. Aab,⁶³ P. Abreu,⁷⁰ M. Aglietta,^{48,47} I. Al Samarai,²⁹ I.F.M. Albuquerque,¹⁶ I. Allekotte,¹
A. Almela,^{8,11} J. Alvarez Castillo,⁶² J. Alvarez-Muñiz,⁷⁹ G.A. Anastasi,³⁸ L. Anchordoqui,⁸³
B. Andrada,⁸ S. Andringa,⁷⁰ C. Aramo,⁴⁵ F. Arquerros,⁷⁷ N. Arsene,⁷³ H. Asorey,^{1,24} P. Assis,⁷⁰
J. Aublin,²⁹ G. Avila,^{9,10} A.M. Badescu,⁷⁴ A. Balaceanu,⁷¹ R.J. Barreira Luz,⁷⁰ J.J. Beatty,⁸⁸
K.H. Becker,³¹ J.A. Bellido,¹² C. Berat,³⁰ M.E. Bertaina,^{56,47} X. Bertou,¹ P.L. Biermann,^b
P. Billoir,²⁹ J. Biteau,²⁸ S.G. Blaess,¹² A. Blanco,⁷⁰ J. Blazek,²⁵ C. Bleve,^{50,43} M. Boháčová,²⁵
D. Boncioli,^{40,d} C. Bonifazi,²² N. Borodai,⁶⁷ A.M. Botti,^{8,33} J. Brack,⁸² I. Brancus,⁷¹ T. Bretz,³⁵
A. Bridgeman,³³ F.L. Briechle,³⁵ P. Buchholz,³⁷ A. Bueno,⁷⁸ S. Buitink,⁶³ M. Buscemi,^{52,42}
K.S. Caballero-Mora,⁶⁰ L. Caccianiga,⁵³ A. Cancio,^{11,8} F. Canfora,⁶³ L. Caramete,⁷² R. Caruso,^{52,42}
A. Castellina,^{48,47} G. Cataldi,⁴³ L. Cazon,⁷⁰ A.G. Chavez,⁶¹ J.A. Chinellato,¹⁷ J. Chudoba,²⁵
R.W. Clay,¹² R. Colalillo,^{54,45} A. Coleman,⁸⁹ L. Collica,⁴⁷ M.R. Coluccia,^{50,43} R. Conceição,⁷⁰
F. Contreras,^{9,10} M.J. Cooper,¹² S. Coutu,⁸⁹ C.E. Covault,⁸⁰ J. Cronin,^{90,†} S. D'Amico,^{49,43}
B. Daniel,¹⁷ S. Dasso,^{5,3} K. Daumiller,³³ B.R. Dawson,¹² R.M. de Almeida,²³ S.J. de Jong,^{63,65}
G. De Mauro,⁶³ J.R.T. de Mello Neto,²² I. De Mitri,^{50,43} J. de Oliveira,²³ V. de Souza,¹⁵
J. Debatin,³³ O. Deligny,²⁸ C. Di Giulio,^{55,46} A. di Matteo,^{51,41,e} M.L. Díaz Castro,¹⁷ F. Diogo,⁷⁰
C. Dobrigkeit,¹⁷ J.C. D'Olivo,⁶² Q. Dorosti,³⁷ R.C. dos Anjos,²¹ M.T. Dova,⁴ A. Dundovic,³⁶
J. Ebr,²⁵ R. Engel,³³ M. Erdmann,³⁵ M. Erfani,³⁷ C.O. Escobar,^g J. Espadanal,⁷⁰
A. Etchegoyen,^{8,11} H. Falcke,^{63,66,65} G. Farrar,⁸⁶ A.C. Fauth,¹⁷ N. Fazzini,^g B. Fick,⁸⁵
J.M. Figueira,⁸ A. Filipčič,^{75,76} O. Fratu,⁷⁴ M.M. Freire,⁶ T. Fujii,⁹⁰ A. Fuster,^{8,11} R. Gaior,²⁹
B. García,⁷ D. Garcia-Pinto,⁷⁷ F. Gaté,^f H. Gemmeke,³⁴ A. Gherghel-Lascu,⁷¹ P.L. Ghia,²⁸
U. Giaccari,²² M. Giammarchi,⁴⁴ M. Giller,⁶⁸ D. Glas,⁶⁹ C. Glaser,³⁵ G. Golup,¹ M. Gómez
Berisso,¹ P.F. Gómez Vitale,^{9,10} N. González,^{8,33} A. Gorgi,^{48,47} P. Gorham,⁹¹ A.F. Grillo,^{40,†}
T.D. Grubb,¹² F. Guarino,^{54,45} G.P. Guedes,¹⁸ M.R. Hampel,⁸ P. Hansen,⁴ D. Harari,¹
T.A. Harrison,¹² J.L. Harton,⁸² A. Haungs,³³ T. Hebbeker,³⁵ D. Heck,³³ P. Heimann,³⁷
A.E. Herve,³² G.C. Hill,¹² C. Hojvat,^g E. Holt,^{33,8} P. Homola,⁶⁷ J.R. Hörandel,^{63,65} P. Horvath,²⁶
M. Hrabovský,²⁶ T. Huege,³³ J. Hulsman,^{8,33} A. Insolia,^{52,42} P.G. Isar,⁷² I. Jandt,³¹ S. Jansen,^{63,65}
J.A. Johnsen,⁸¹ M. Josebachuili,⁸ A. Kääpä,³¹ O. Kambeitz,³² K.H. Kampert,³¹ I. Katkov,³²
B. Keilhauer,³³ E. Kemp,¹⁷ J. Kemp,³⁵ R.M. Kieckhafer,⁸⁵ H.O. Klages,³³ M. Kleifges,³⁴
J. Kleinfeller,⁹ R. Krause,³⁵ N. Krohm,³¹ D. Kuempel,³⁵ G. Kukec Mezek,⁷⁶ N. Kunka,³⁴ A. Kuotb
Awad,³³ D. LaHurd,⁸⁰ M. Lauscher,³⁵ R. Legumina,⁶⁸ M.A. Leigui de Oliveira,²⁰
A. Letessier-Selvon,²⁹ I. Lhenry-Yvon,²⁸ K. Link,³² L. Lopes,⁷⁰ R. López,⁵⁷ A. López Casado,⁷⁹
Q. Luce,²⁸ A. Lucero,^{8,11} M. Malacari,⁹⁰ M. Mallamaci,^{53,44} D. Mandat,²⁵ P. Mantsch,^g
A.G. Mariazzi,⁴ I.C. Mariş,⁷⁸ G. Marsella,^{50,43} D. Martello,^{50,43} H. Martinez,⁵⁸ O. Martínez
Bravo,⁵⁷ J.J. Masías Meza,³ H.J. Mathes,³³ S. Mathys,³¹ J. Matthews,⁸⁴ J.A.J. Matthews,⁹³
G. Matthiae,^{55,46} E. Mayotte,³¹ P.O. Mazur,^g C. Medina,⁸¹ G. Medina-Tanco,⁶² D. Melo,⁸
A. Menshikov,³⁴ M.I. Micheletti,⁶ L. Middelndorf,³⁵ I.A. Minaya,⁷⁷ L. Miramonti,^{53,44} B. Mitrica,⁷¹
D. Mockler,³² S. Mollerach,¹ F. Montanet,³⁰ C. Morello,^{48,47} M. Mostafá,⁸⁹ A.L. Müller,^{8,33}
G. Müller,³⁵ M.A. Muller,^{17,19} S. Müller,^{33,8} R. Mussa,⁴⁷ I. Naranjo,¹ L. Nellen,⁶² P.H. Nguyen,¹²
M. Niculescu-Oglinzu,⁷¹ M. Niechciol,³⁷ L. Niemietz,³¹ T. Niggemann,³⁵ D. Nitz,⁸⁵ D. Nosek,²⁷
V. Novotny,²⁷ H. Nožka,²⁶ L.A. Núñez,²⁴ L. Ochilo,³⁷ F. Oikonomou,⁸⁹ A. Olinto,⁹⁰ M. Palatka,²⁵
J. Pallotta,² P. Papenbreer,³¹ G. Parente,⁷⁹ A. Parra,⁵⁷ T. Paul,^{87,83} M. Pech,²⁵ F. Pedreira,⁷⁹
J. Pękala,⁶⁷ R. Pelayo,⁵⁹ J. Peña-Rodríguez,²⁴ L. A. S. Pereira,¹⁷ M. Perlín,⁸ L. Perrone,^{50,43}
C. Peters,³⁵ S. Petrera,^{51,38,41} J. Phuntsok,⁸⁹ R. Piegaiia,³ T. Pierog,³³ P. Pieroni,³ M. Pimenta,⁷⁰
V. Pirronello,^{52,42} M. Platino,⁸ M. Plum,³⁵ C. Porowski,⁶⁷ R.R. Prado,¹⁵ P. Privitera,⁹⁰
M. Prouza,²⁵ E.J. Quel,² S. Querschfeld,³¹ S. Quinn,⁸⁰ R. Ramos-Pollan,²⁴ J. Rautenberg,³¹
D. Ravignani,⁸ B. Revenu,^f J. Ridky,²⁵ M. Risse,³⁷ P. Ristori,² V. Rizi,^{51,41} W. Rodrigues de
Carvalho,¹⁶ G. Rodríguez Fernandez,^{55,46} J. Rodríguez Rojo,⁹ D. Rogozin,³³ M.J. Roncoroni,⁸
M. Roth,³³ E. Roulet,¹ A.C. Rovero,⁵ P. Ruehl,³⁷ S.J. Saffi,¹² A. Saftoiu,⁷¹ F. Salamida,^{51,41}
H. Salazar,⁵⁷ A. Saleh,⁷⁶ F. Salesa Greus,⁸⁹ G. Salina,⁴⁶ F. Sánchez,⁸ P. Sanchez-Lucas,⁷⁸
E.M. Santos,¹⁶ E. Santos,⁸ F. Sarazin,⁸¹ R. Sarmento,⁷⁰ C.A. Sarmiento,⁸ R. Sato,⁹ M. Schauer,³¹
V. Scherini,⁴³ H. Schieler,³³ M. Schimp,³¹ D. Schmidt,^{33,8} O. Scholten,^{64,c} P. Schovánek,²⁵

F.G. Schröder,³³ A. Schulz,³² J. Schulz,⁶³ J. Schumacher,³⁵ S.J. Sciutto,⁴ A. Segreto,^{39,42} M. Settimo,²⁹ A. Shadkam,⁸⁴ R.C. Shellard,¹³ G. Sigl,³⁶ G. Silli,^{8,33} O. Sima,⁷³ A. Śmiałkowski,⁶⁸ R. Šmída,³³ G.R. Snow,⁹² P. Sommers,⁸⁹ S. Sonntag,³⁷ J. Sorokin,¹² R. Squartini,⁹ D. Stanca,⁷¹ S. Stanić,⁷⁶ J. Stasielak,⁶⁷ P. Stassi,³⁰ F. Strafella,^{50,43} F. Suarez,^{8,11} M. Suarez Durán,²⁴ T. Sudholz,¹² T. Suomijärvi,²⁸ A.D. Supanitsky,⁵ J. Swain,⁸⁷ Z. Szadkowski,⁶⁹ A. Taboada,³² O.A. Taborda,¹ A. Tapia,⁸ V.M. Theodoro,¹⁷ C. Timmermans,^{65,63} C.J. Todero Peixoto,¹⁴ L. Tomankova,³³ B. Tomé,⁷⁰ G. Torralba Elipse,⁷⁹ P. Travnicek,²⁵ M. Trini,⁷⁶ R. Ulrich,³³ M. Unger,³³ M. Urban,³⁵ J.F. Valdés Galicia,⁶² I. Valiño,⁷⁹ L. Valore,^{54,45} G. van Aar,⁶³ P. van Bodegom,¹² A.M. van den Berg,⁶⁴ A. van Vliet,⁶³ E. Varela,⁵⁷ B. Vargas Cárdenas,⁶² G. Varner,⁹¹ J.R. Vázquez,⁷⁷ R.A. Vázquez,⁷⁹ D. Veberič,³³ I.D. Vergara Quispe,⁴ V. Verzi,⁴⁶ J. Vicha,²⁵ L. Villaseñor,⁶¹ S. Vorobiov,⁷⁶ H. Wahlberg,⁴ O. Wainberg,^{8,11} D. Walz,³⁵ A.A. Watson,^a M. Weber,³⁴ A. Weindl,³³ L. Wiencke,⁸¹ H. Wilczyński,⁶⁷ T. Winchen,³¹ M. Wirtz,³⁵ D. Wittkowski,³¹ B. Wundheiler,⁸ L. Yang,⁷⁶ D. Yelos,^{11,8} A. Yushkov,⁸ E. Zas,⁷⁹ D. Zavrtanik,^{76,75} M. Zavrtanik,^{75,76} A. Zepeda,⁵⁸ B. Zimmermann,³⁴ M. Ziolkowski,³⁷ Z. Zong²⁸ and Z. Zong²⁸

¹ Centro Atómico Bariloche and Instituto Balseiro (CNEA-UNCuyo-CONICET), Argentina

² Centro de Investigaciones en Láseres y Aplicaciones, CITEDEF and CONICET, Argentina

³ Departamento de Física and Departamento de Ciencias de la Atmósfera y los Océanos, FCEyN, Universidad de Buenos Aires, Argentina

⁴ IFLP, Universidad Nacional de La Plata and CONICET, Argentina

⁵ Instituto de Astronomía y Física del Espacio (IAFE, CONICET-UBA), Argentina

⁶ Instituto de Física de Rosario (IFIR) — CONICET/U.N.R. and Facultad de Ciencias Bioquímicas y Farmacéuticas U.N.R., Argentina

⁷ Instituto de Tecnologías en Detección y Astropartículas (CNEA, CONICET, UNSAM) and Universidad Tecnológica Nacional — Facultad Regional Mendoza (CONICET/CNEA), Argentina

⁸ Instituto de Tecnologías en Detección y Astropartículas (CNEA, CONICET, UNSAM), Centro Atómico Constituyentes, Comisión Nacional de Energía Atómica, Argentina

⁹ Observatorio Pierre Auger, Argentina

¹⁰ Observatorio Pierre Auger and Comisión Nacional de Energía Atómica, Argentina

¹¹ Universidad Tecnológica Nacional — Facultad Regional Buenos Aires, Argentina

¹² University of Adelaide, Australia

¹³ Centro Brasileiro de Pesquisas Físicas (CBPF), Brazil

¹⁴ Universidade de São Paulo, Escola de Engenharia de Lorena, Brazil

¹⁵ Universidade de São Paulo, Inst. de Física de São Carlos, São Carlos, Brazil

¹⁶ Universidade de São Paulo, Inst. de Física, São Paulo, Brazil

¹⁷ Universidade Estadual de Campinas (UNICAMP), Brazil

¹⁸ Universidade Estadual de Feira de Santana (UEFS), Brazil

¹⁹ Universidade Federal de Pelotas, Brazil

²⁰ Universidade Federal do ABC (UFABC), Brazil

²¹ Universidade Federal do Paraná, Setor Palotina, Brazil

²² Universidade Federal do Rio de Janeiro (UFRJ), Instituto de Física, Brazil

²³ Universidade Federal Fluminense, Brazil

²⁴ Universidad Industrial de Santander, Colombia

²⁵ Institute of Physics (FZU) of the Academy of Sciences of the Czech Republic, Czech Republic

²⁶ Palacky University, RCPTM, Czech Republic

²⁷ University Prague, Institute of Particle and Nuclear Physics, Czech Republic

²⁸ Institut de Physique Nucléaire d'Orsay (IPNO), Université Paris-Sud, Univ. Paris/Saclay, CNRS-IN2P3, France, France

²⁹ Laboratoire de Physique Nucléaire et de Hautes Energies (LPNHE), Universités Paris 6 et Paris 7, CNRS-IN2P3, France

³⁰ Laboratoire de Physique Subatomique et de Cosmologie (LPSC), Université Grenoble-Alpes, CNRS-IN2P3, France

³¹ Bergische Universität Wuppertal, Department of Physics, Germany

³² Karlsruhe Institute of Technology, Institut für Experimentelle Kernphysik (IEKP), Germany

³³ Karlsruhe Institute of Technology, Institut für Kernphysik (IKP), Germany

³⁴ Karlsruhe Institute of Technology, Institut für Prozessdatenverarbeitung und Elektronik (IPE), Germany

³⁵ RWTH Aachen University, III. Physikalisches Institut A, Germany

- ³⁶ *Universität Hamburg, II. Institut für Theoretische Physik, Germany*
- ³⁷ *Universität Siegen, Fachbereich 7 Physik — Experimentelle Teilchenphysik, Germany*
- ³⁸ *Gran Sasso Science Institute (INFN), L'Aquila, Italy*
- ³⁹ *INAF — Istituto di Astrofisica Spaziale e Fisica Cosmica di Palermo, Italy*
- ⁴⁰ *INFN Laboratori Nazionali del Gran Sasso, Italy*
- ⁴¹ *INFN, Gruppo Collegato dell'Aquila, Italy*
- ⁴² *INFN, Sezione di Catania, Italy*
- ⁴³ *INFN, Sezione di Lecce, Italy*
- ⁴⁴ *INFN, Sezione di Milano, Italy*
- ⁴⁵ *INFN, Sezione di Napoli, Italy*
- ⁴⁶ *INFN, Sezione di Roma "Tor Vergata", Italy*
- ⁴⁷ *INFN, Sezione di Torino, Italy*
- ⁴⁸ *Osservatorio Astrofisico di Torino (INAF), Torino, Italy*
- ⁴⁹ *Università del Salento, Dipartimento di Ingegneria, Italy*
- ⁵⁰ *Università del Salento, Dipartimento di Matematica e Fisica "E. De Giorgi", Italy*
- ⁵¹ *Università dell'Aquila, Dipartimento di Scienze Fisiche e Chimiche, Italy*
- ⁵² *Università di Catania, Dipartimento di Fisica e Astronomia, Italy*
- ⁵³ *Università di Milano, Dipartimento di Fisica, Italy*
- ⁵⁴ *Università di Napoli "Federico II", Dipartimento di Fisica "Ettore Pancini", Italy*
- ⁵⁵ *Università di Roma "Tor Vergata", Dipartimento di Fisica, Italy*
- ⁵⁶ *Università Torino, Dipartimento di Fisica, Italy*
- ⁵⁷ *Benemérita Universidad Autónoma de Puebla (BUAP), México*
- ⁵⁸ *Centro de Investigación y de Estudios Avanzados del IPN (CINVESTAV), México*
- ⁵⁹ *Unidad Profesional Interdisciplinaria en Ingeniería y Tecnologías Avanzadas del Instituto Politécnico Nacional (UPIITA-IPN), México*
- ⁶⁰ *Universidad Autónoma de Chiapas, México*
- ⁶¹ *Universidad Michoacana de San Nicolás de Hidalgo, México*
- ⁶² *Universidad Nacional Autónoma de México, México*
- ⁶³ *Institute for Mathematics, Astrophysics and Particle Physics (IMAPP), Radboud Universiteit, Nijmegen, Netherlands*
- ⁶⁴ *KVI — Center for Advanced Radiation Technology, University of Groningen, Netherlands*
- ⁶⁵ *Nationaal Instituut voor Kernfysica en Hoge Energie Fysica (NIKHEF), Netherlands*
- ⁶⁶ *Stichting Astronomisch Onderzoek in Nederland (ASTRON), Dwingeloo, Netherlands*
- ⁶⁷ *Institute of Nuclear Physics PAN, Poland*
- ⁶⁸ *University of Łódź, Faculty of Astrophysics, Poland*
- ⁶⁹ *University of Łódź, Faculty of High-Energy Astrophysics, Poland*
- ⁷⁰ *Laboratório de Instrumentação e Física Experimental de Partículas — LIP and Instituto Superior Técnico — IST, Universidade de Lisboa — UL, Portugal*
- ⁷¹ *"Horia Hulubei" National Institute for Physics and Nuclear Engineering, Romania*
- ⁷² *Institute of Space Science, Romania*
- ⁷³ *University of Bucharest, Physics Department, Romania*
- ⁷⁴ *University Politehnica of Bucharest, Romania*
- ⁷⁵ *Experimental Particle Physics Department, J. Stefan Institute, Slovenia*
- ⁷⁶ *Laboratory for Astroparticle Physics, University of Nova Gorica, Slovenia*
- ⁷⁷ *Universidad Complutense de Madrid, Spain*
- ⁷⁸ *Universidad de Granada and C.A.F.P.E., Spain*
- ⁷⁹ *Universidad de Santiago de Compostela, Spain*
- ⁸⁰ *Case Western Reserve University, U.S.A.*
- ⁸¹ *Colorado School of Mines, U.S.A.*
- ⁸² *Colorado State University, U.S.A.*
- ⁸³ *Department of Physics and Astronomy, Lehman College, City University of New York, U.S.A.*
- ⁸⁴ *Louisiana State University, U.S.A.*
- ⁸⁵ *Michigan Technological University, U.S.A.*
- ⁸⁶ *New York University, U.S.A.*
- ⁸⁷ *Northeastern University, U.S.A.*
- ⁸⁸ *Ohio State University, U.S.A.*
- ⁸⁹ *Pennsylvania State University, U.S.A.*
- ⁹⁰ *University of Chicago, U.S.A.*

⁹¹ *University of Hawaii, U.S.A.*

⁹² *University of Nebraska, U.S.A.*

⁹³ *University of New Mexico, U.S.A.*

(a) *School of Physics and Astronomy, University of Leeds, Leeds, United Kingdom*

(b) *Max-Planck-Institut für Radioastronomie, Bonn, Germany*

(c) *also at Vrije Universiteit Brussels, Brussels, Belgium*

(d) *now at Deutsches Elektronen-Synchrotron (DESY), Zeuthen, Germany*

(e) *now at Université Libre de Bruxelles (ULB), Brussels, Belgium*

(f) *SUBATECH, École des Mines de Nantes, CNRS-IN2P3, Université de Nantes*

(g) *Fermi National Accelerator Laboratory, U.S.A.*

(†) *Deceased*