

Encyclopedia of Engineering Geology

2018 Edition

| Editors: Peter T. Bobrowsky, Brian Marker

Physical Weathering

- António B. Pinho (1) Email author (apinho@uevora.pt)
- Pedro Santarém Andrade (2)
- Isabel M. R. Duarte (1)

1. GeoBioTec Research Centre (UID/GEO/04035/2013), Department of Geosciences, School of Sciences and Technology, University of Évora, , Évora, Portugal

2. Geosciences Centre (UID/Multi/00073/2013), Department of Earth Sciences, University of Coimbra, , Coimbra, Portugal

Reference work entry

First Online: 01 August 2018

DOI: https://doi.org/10.1007/978-3-319-73568-9_219

- [6 Downloads](#)

Synonyms

Disintegration; Fragmentation; Mechanical weathering; Slaking

Definition

Physical weathering of rocks consists of their physical disintegration, without chemical weathering, by several physical processes such as (a) significant diurnal and/or seasonal thermal variations, (b) expansion and fracturing of rock due either to stress relief or increase of pressure in rock pores and fissures by expansion volume associated with water freezing, and (c) mechanical actions of several weathering agents including water flow, glaciers, wind, living organisms (e.g., roots of trees, cavities made by rodents), and the growth of poorly soluble salts, in rock pores, either by crystallization pressure, such as hydration pressure or by differential thermal expansion. These are of fundamental importance in the breakdown and fragmentation of rocks.

Introduction

The weathering of rocks is an important geological phenomenon because it leads to the formation of soils (whether residual or sedimentary).

T...

This is a preview of subscription content, [log in](#) to check access.

References

Andrade PS, Saraiva AA (2010) Physical and mechanical characterization of phyllites and metagreywackes in central Portugal. *Bull Eng Geol Environ* 69(2):207–214

[CrossRef](#) (<https://doi.org/10.1007/s10064-009-0251-9>)

[Google Scholar](#) (http://scholar.google.com/scholar_lookup?title=Physical%20and%20mechanical%20characterization%20of%20phyllites%20and%20metagreywackes%20in%20central%20Portugal&author=PS.%20Andrade&author=AA.%20Saraiva&journal=Bull%20Eng%20Geol%20Environ&volume=69&issue=2&pages=207-214&publication_year=2010)

Anon (1995) The description and classification of weathered rocks for engineering purposes. (Geological Society Engineering Group Working Party Report). *Q J Eng Geol* 28:207–242

[CrossRef](#) (<https://doi.org/10.1144/GSL.QJEGH.1995.028.P3.02>)

[Google Scholar](#) (http://scholar.google.com/scholar_lookup?title=The%20description%20and%20classification%20of%20weathered%20rocks%20for%20engineering%20purposes.%20%28Geological%20Society%20Engineering%20Group%20Working%20Party%20Report%29&author=.%20Anon&journal=Q%20J%20Eng%20Geol&volume=28&pages=207-242&publication_year=1995)

Cooke RU, Warren A, Goudie AS (1993) Desert geomorphology. UCL Press, London

[Google Scholar](#) (http://scholar.google.com/scholar_lookup?title=Desert%20geomorphology&author=RU.%20Cooke&author=A.%20Warren&author=AS.%20Goudie&publication_year=1993)

Cragg DJ, Ingman J (1995) Rock weathering descriptions: current difficulties. *Q J Eng Geol* 28:277–286

[CrossRef](#) (<https://doi.org/10.1144/GSL.QJEGH.1995.028.P3.06>)

[Google Scholar](#) (http://scholar.google.com/scholar_lookup?title=Rock%20weathering%20descriptions%3A%20current%20difficulties&author=DJ.%20Cragg&author=J.%20Ingman&journal=Q%20J%20Eng%20Geol&volume=28&pages=277-286&publication_year=1995)

Dearman WR (1986) State of weathering: the search for a rational approach. In: Hawkins AB (ed) Site investigation practice: assessing BS5930, Engineering Geology Special Publication, vol 2. Geological Society, London, pp 132–142

[Google Scholar](#) (http://scholar.google.com/scholar_lookup?title=State%20of%20weathering%3A%20the%20search%20for%20a%20rational%20approach&author=WR.%20Dearman&pages=132-142&publication_year=1986)

Duarte IMR (2002) Solos residuais de rochas granitoides a Sul do Tejo.

Características geológicas e geotécnicas [Residual soils of granitoid rocks to south of the Tagus River. Geological and geotechnical characteristics]. Unpublished Doctoral Dissertation, in Portuguese. University of Évora, Évora

[Google Scholar](#) (<https://scholar.google.com/scholar?q=Duarte%20IMR%20%282002%29%20Solos%20residuais%20de%20rochas%20granitoides%20a%20Sul%20do%20Tejo.%20Caracter%3ADsticas%20geol%C3%B3gicas%20e%20geot%C3%A9cnicas%20%5BResidual%20soils%20of%20granitoid%20rocks%20to%20south%20of%20the%20Tagus%20River.%20Geological%20and%20geotechnical%20characteristics%5D.%20Unpublished%20Doctoral%20Dissertation%2C%20in%20Portuguese.%20University%20of%20%C3%89vora%2C%20%C3%89vora>)

Hencher SR, McNicholl DP (1995) Engineering in weathered rock. *Q J Eng Geol* 28:253–266

CrossRef (<https://doi.org/10.1144/GSL.QJEGH.1995.028.P3.04>)

Google Scholar ([http://scholar.google.com/scholar_lookup?](http://scholar.google.com/scholar_lookup?title=Engineering%20in%20weathered%20rock&author=SR.%20Hencher&author=DP.%20McNicholl&journal=Q%20J%20Eng%20Geol&volume=28&pages=253-266&publication_year=1995)

[title=Engineering%20in%20weathered%20rock&author=SR.%20Hencher&author=DP.%20McNicholl&journal=Q%20J%20Eng%20Geol&volume=28&pages=253-266&publication_year=1995](http://scholar.google.com/scholar_lookup?title=Engineering%20in%20weathered%20rock&author=SR.%20Hencher&author=DP.%20McNicholl&journal=Q%20J%20Eng%20Geol&volume=28&pages=253-266&publication_year=1995))

Lisø KR, Myhre L, Kvande T, Thue JV, Nordvik V (2007) A Norwegian perspective on buildings and climate change. *Build Res Inf* 35(4):437–449

CrossRef (<https://doi.org/10.1080/09613210701269438>)

Google Scholar ([http://scholar.google.com/scholar_lookup?](http://scholar.google.com/scholar_lookup?title=A%20Norwegian%20perspective%20on%20buildings%20and%20climate%20change&author=KR.%20Lis%C3%B8&author=L.%20Myhre&author=T.%20Kvande&author=JV.%20Thue&author=V.%20Nordvik&journal=Build%20Res%20Inf&volume=35&issue=4&pages=437-449&publication_year=2007)

[title=A%20Norwegian%20perspective%20on%20buildings%20and%20climate%20change&author=KR.%20Lis%C3%B8&author=L.%20Myhre&author=T.%20Kvande&author=JV.%20Thue&author=V.%20Nordvik&journal=Build%20Res%20Inf&volume=35&issue=4&pages=437-449&publication_year=2007](http://scholar.google.com/scholar_lookup?title=A%20Norwegian%20perspective%20on%20buildings%20and%20climate%20change&author=KR.%20Lis%C3%B8&author=L.%20Myhre&author=T.%20Kvande&author=JV.%20Thue&author=V.%20Nordvik&journal=Build%20Res%20Inf&volume=35&issue=4&pages=437-449&publication_year=2007))

Matsuoka N, Murton J (2008) Frost weathering: recent advances and future directions. *Permafrost Periglac* 19:195–210

CrossRef (<https://doi.org/10.1002/ppp.620>)

Google Scholar ([http://scholar.google.com/scholar_lookup?](http://scholar.google.com/scholar_lookup?title=Frost%20weathering%3A%20recent%20advances%20and%20future%20directions&author=N.%20Matsuoka&author=J.%20Murton&journal=Permafrost%20Periglac&volume=19&pages=195-210&publication_year=2008)

[title=Frost%20weathering%3A%20recent%20advances%20and%20future%20directions&author=N.%20Matsuoka&author=J.%20Murton&journal=Permafrost%20Periglac&volume=19&pages=195-210&publication_year=2008](http://scholar.google.com/scholar_lookup?title=Frost%20weathering%3A%20recent%20advances%20and%20future%20directions&author=N.%20Matsuoka&author=J.%20Murton&journal=Permafrost%20Periglac&volume=19&pages=195-210&publication_year=2008))

McCabe S, Smith BJ, Warke PA (2010) Exploitation of inherited weakness in fire-damaged building sandstone: the “fatiguing” of “shocked” stone. *Eng Geol* 115:217–225

CrossRef (<https://doi.org/10.1016/j.enggeo.2009.06.003>)

Google Scholar ([http://scholar.google.com/scholar_lookup?](http://scholar.google.com/scholar_lookup?title=Exploitation%20of%20inherited%20weakness%20in%20fire-damaged%20building%20sandstone%3A%20the%20%20E2%80%9Cfatiguing%E2%80%9D%20of%20%20E2%80%9Cshocked%E2%80%9D%20stone&author=S.%20McCabe&author=BJ.%20Smith&author=PA.%20Warke&journal=Eng%20Geol&volume=115&pages=217-225&publication_year=2010)

[title=Exploitation%20of%20inherited%20weakness%20in%20fire-damaged%20building%20sandstone%3A%20the%20%20E2%80%9Cfatiguing%E2%80%9D%20of%20%20E2%80%9Cshocked%E2%80%9D%20stone&author=S.%20McCabe&author=BJ.%20Smith&author=PA.%20Warke&journal=Eng%20Geol&volume=115&pages=217-225&publication_year=2010](http://scholar.google.com/scholar_lookup?title=Exploitation%20of%20inherited%20weakness%20in%20fire-damaged%20building%20sandstone%3A%20the%20%20E2%80%9Cfatiguing%E2%80%9D%20of%20%20E2%80%9Cshocked%E2%80%9D%20stone&author=S.%20McCabe&author=BJ.%20Smith&author=PA.%20Warke&journal=Eng%20Geol&volume=115&pages=217-225&publication_year=2010))

Pinho AB (2003) Caracterização geotécnica de maciços rochosos de baixa resistência. O Flynch do Baixo Alentejo [Geotechnical characterization of weak rock masses – the Baixo Alentejo Flynch Group]. Unpublished Doctoral Dissertation, in Portuguese. University of Évora, Évora

Google Scholar ([https://scholar.google.com/scholar?](https://scholar.google.com/scholar?q=Pinho%20AB%20%282003%29%20Caracteriza%C3%A7%C3%A3o%20geot%C3%A9cnica%20de%20maci%C3%A7os%20rochosos%20de%20baixa%20resist%C3%Aancia.%20O%20Flynch%20do%20Baixo%20Alentejo%20%5BGeotechnical%20characterization%20of%20weak%20rock%20masses%20%E2%80%93%20the%20Baixo%20Alentejo%20Flynch%20Group%5D.%20Unpublished%20Doctoral%20Dissertation%2C%20in%20Portuguese.%20University%20of%20%C3%89vora%2C%20%C3%89vora)

[q=Pinho%20AB%20%282003%29%20Caracteriza%C3%A7%C3%A3o%20geot%C3%A9cnica%20de%20maci%C3%A7os%20rochosos%20de%20baixa%20resist%C3%Aancia.%20O%20Flynch%20do%20Baixo%20Alentejo%20%5BGeotechnical%20characterization%20of%20weak%20rock%20masses%20%E2%80%93%20the%20Baixo%20Alentejo%20Flynch%20Group%5D.%20Unpublished%20Doctoral%20Dissertation%2C%20in%20Portuguese.%20University%20of%20%C3%89vora%2C%20%C3%89vora](https://scholar.google.com/scholar?q=Pinho%20AB%20%282003%29%20Caracteriza%C3%A7%C3%A3o%20geot%C3%A9cnica%20de%20maci%C3%A7os%20rochosos%20de%20baixa%20resist%C3%Aancia.%20O%20Flynch%20do%20Baixo%20Alentejo%20%5BGeotechnical%20characterization%20of%20weak%20rock%20masses%20%E2%80%93%20the%20Baixo%20Alentejo%20Flynch%20Group%5D.%20Unpublished%20Doctoral%20Dissertation%2C%20in%20Portuguese.%20University%20of%20%C3%89vora%2C%20%C3%89vora))

Pinho AB, Rodrigues-Carvalho JA, Gomes CF, Duarte IMR (2009) Overview of the evaluation of the state of rock weathering by visual inspection. In: Culshaw MG, Reeves HJ, Jefferson I, Spink TW (eds) *Engineering Geology for Tomorrow's Cities*. (22, on CD-ROM insert, Paper 260), Engineering geology special publication. Geological Society, London

Google Scholar ([http://scholar.google.com/scholar_lookup?](http://scholar.google.com/scholar_lookup?title=Overview%20of%20the%20evaluation%20of%20the%20state%20of%20rock%20weathering%20by%20visual%20inspection&author=AB.%20Pinho&author=JA.%20Rodrigues-Carvalho&author=CF.%20Gomes&author=IMR.%20Duarte&publication_year=2009)

[title=Overview%20of%20the%20evaluation%20of%20the%20state%20of%20rock%20weathering%20by%20visual%20inspection&author=AB.%20Pinho&author=JA.%20Rodrigues-Carvalho&author=CF.%20Gomes&author=IMR.%20Duarte&publication_year=2009](http://scholar.google.com/scholar_lookup?title=Overview%20of%20the%20evaluation%20of%20the%20state%20of%20rock%20weathering%20by%20visual%20inspection&author=AB.%20Pinho&author=JA.%20Rodrigues-Carvalho&author=CF.%20Gomes&author=IMR.%20Duarte&publication_year=2009))

Wesley LD (2010) Fundamentals of soil mechanics for sedimentary and residual soils. Willey, Hoboken

Google Scholar (http://scholar.google.com/scholar_lookup?title=Fundamentals%20of%20soil%20mechanics%20for%20sedimentary%20and%20residual%20soils&author=LD.%20Wesley&publication_year=2010)

Copyright information

© Springer International Publishing AG, part of Springer Nature 2018

How to cite

Cite this entry as:

Pinho A.B., Andrade P.S., Duarte I.M.R. (2018) Physical Weathering. In: Bobrowsky P.T., Marker B. (eds) Encyclopedia of Engineering Geology. Encyclopedia of Earth Sciences Series. Springer, Cham

About this entry

- First Online 01 August 2018
- DOI <https://doi.org/10.1007/978-3-319-73568-9>
- Publisher Name Springer, Cham
- Print ISBN 978-3-319-73566-5
- Online ISBN 978-3-319-73568-9
- eBook Packages [Earth and Environmental Science](#)
- [Buy this book on publisher's site](#)
- [Reprints and Permissions](#)

SPRINGER NATURE

© 2018 Springer Nature Switzerland AG. Part of [Springer Nature](#).

Not logged in Not affiliated 85.242.47.177