



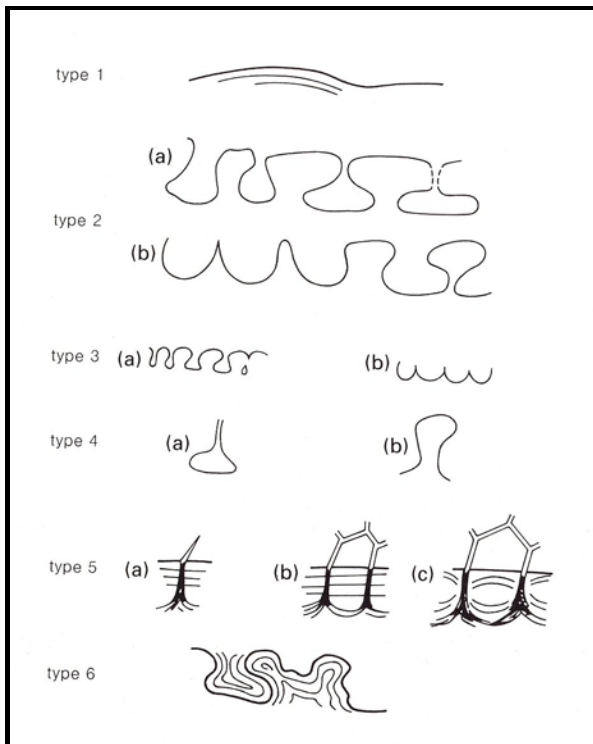
South Wales RIGS Group Site Record RIGS Description

SECTION A

General	South Wales
Site Name: Sully Cliffs	File Number: Site_AH_61
RIGS Number: 746	Surveyed by: T Sharpe, A Humpage, R Kendall
Grid Reference: ST 16243 67530	Date of Visit: 2010
RIGS Category: Scientific, Educational	Date Registered:
Earth Science Category: Geomorphological	
Site Nature: Foreshore	Documentation prepared by: Adrian Humpage
Unitary Authority: Vale of Glamorgan	Documentation last revised: 19 September 2011
OS 1:50,000 Sheet 171	Photographic Record: See images attached to this report
OS 1:25,000 Explorer Sheet 151	
BGS 1:50,000 Sheet 263	
<p>RIGS Statement of Interest: Some fourteen ice-wedge casts and periglacial involutions occur along a 210 m long cliff section in the sea cliffs along the foreshore south of the playing fields of Sully Sports and Social Club.</p> <p>The presence of ice wedge casts provide information on the thermal conditions of the environment at the time of the formation of the original ice wedges. Low mean annual air temperatures (MAAT) and extremely cold dry winter temperatures, perhaps exceeding -40°C are required for the development of ice wedges.</p> <p>Involutions can form in more benign environments and are influenced by the soil, silts being more frost susceptible, the thickness of the annual active-layer and the soil moisture content. The freezing fronts, advancing from the surface downwards and upwards from the permafrost table undulates through the soil depending on the soil grain size and presence of clasts, and differential water pressures build up within the soil as consequence, resulting in diapiric type structures, the re-orienting of soil grains and clasts and the gradual sorting of soil material, to result the surface in a patterned grounds of stone polygons on horizontal surfaces, or stone stripes on slopes.</p>	

Geological setting/context:

On level ground, temporary fluidisation of the soil may result in density-driven diapiric movements resulting in cryoturbation structures and involutions.



Morphological classification of cryoturbation structures in terms of symmetry, amplitude:wavelength ratio and pattern of occurrence (after Vandenberghe 1988):

type 1: individual folds of small amplitude but large wavelength; type 2: fairly regular, symmetrical and intensely convoluted forms with amplitudes of 0.6-2.0m; type 3:similar to type 2 but with smaller amplitudes; type 4: solitary "teardrop" or diapiric forms; type 5: upwards injected sediment in cracks; type 6: irregular deformation structures



Large-scale irregular involutions at Llanon, Dyfed, west Wales
Photograph courtesy Prof. C. Harris

Ice wedges are classified as 'vein ice' and form when the winter ground conditions

are such that thermal contraction occurs and the near surface splits into a series of polygons separated by open cracks. These cracks fill with water in the summer which then freezes and the process is repeated over many cycles as long as the thermal conditions prevail. (see below).

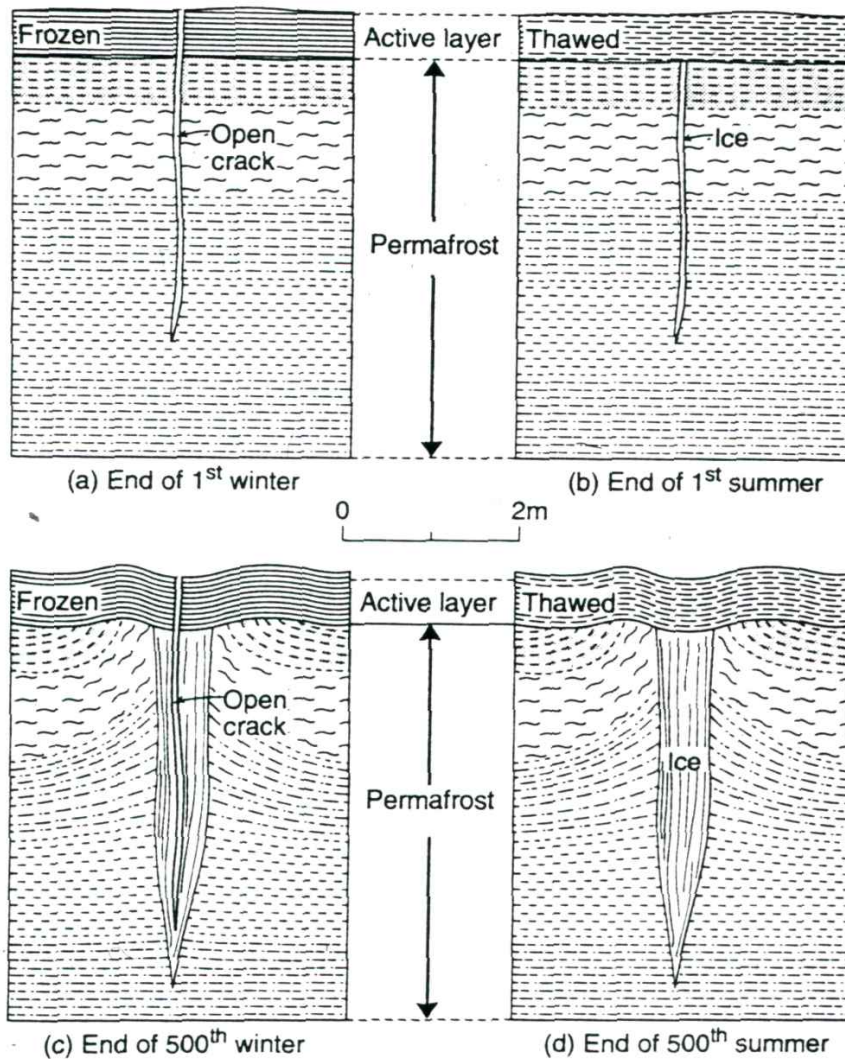


Figure 4.3 Formation of ice wedges by thermal contraction cracking. After Lachenbruch (1962).

Typically, ice wedges form under conditions where the mean annual air temperature (MAAT) is below -15 to -20°C . However, as evidenced by Burn (1990) it is the winter temperature regime which controls the thermal cracking, and temperatures dropping to -40°C and below are required.

References:

Bradshaw, R. & Ingle Smith, D., 1963. Permafrost structures on Sully Island, Glamorgan. *Geological Magazine*, **100**, pp.556-564.

Burn, C. (1990). Implications for palaeoenvironmental reconstruction of recent ice-wedge development at Mayo, Yukon Territory. *Permafrost and Periglacial Processes*, **1**, p.3-14.

Harris, C., 1989. Some possible Devensian ice-wedge casts in Mercia Mudstones near Cardiff, South Wales. *Quaternary Newsletter*, **58**, p.11-13.

Lachenbruch, A. H. (1962). Mechanics of thermal contraction cracks and ice-wedge polygons in permafrost. *Geological Society of America, Special Paper*, 70: 69 pp.

Vandenberghe, J. (1988). Cryoturbations. pp179-198. In: M.J. Clark (Ed). *Advances in Periglacial Geomorphology*. Wiley, Chichester.

SECTION B

PRACTICAL CONSIDERATIONS:

Please score Accessibility and Safety Red Amber or Green

Accessibility:



Comment: The site is accessible along the foreshore from either Sully or Swanbridge. It is not accessible at the highest tides.

Safety:



Comment: The low cliffs may present some risk of rockfall. The foreshore rocks may present a slip and trip hazard.

Conservation status:

There are no known conservation designations on this RIGS

OWNERSHIP/PLANNING CONTROL:

Owner/tenant: Unknown

Planning Authority: Vale of Glamorgan Council

Planning status/constraints/opportunities:

There are no known planning constraints or opportunities

CONDITION, USE & MANAGEMENT:

Present use:

Site condition: Generally good

Potential threats: Erosion, rockfall, cliff protection

Site Management:

SITE DEVELOPMENT:

Potential use (general):

Potential use (educational): An accessible site that exhibits well the impacts of periglacial conditions beyond the glacier ice limits

Other comments:

Photographic Record

Insert photographs. Use separate sheet if required



? Cryoturbation structure in 1.5m high section



Cryoturbated structures in Sully Cliffs



Ice wedge cast in Sully cliffs in c. 1.75m section



Close up of base of ice wedge cast in Sully Cliffs



Base of ice wedge cast