

Introduction of Dinghushan Forest Ecosystem Research Station

Dinghushan Station

Chinese Academy of Sciences

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http://dhs.scib.ac.cn



Outline

Location of Dinghushan

History of Dinghushan Forest Ecosystem Research Station

Long-term ecological research



Global vegetation map (source: NASA)



Excellent venue for ecosystem research



Location and representation

Map of 3D Topography of Dinghu Mountain Research Station of Forest Ecosystem

图例	ų
968.906 -	1000
937.813 -	968.906
906.719 -	937, 813
# 875, 625 -	906, 719
844.531 -	875, 625
813.438 -	844.531
782.344	813, 438
751.250 -	782.344
720, 156 -	751.25
689.063 -	720, 156
657.969 -	689,063
826, 875 -	657, 969
595,781 -	626.875
564.688 -	595.781
533.691 -	564.688
502.500 -	533, 594

Area: 1,133 ha

Elevation: ranging from 10 to 1,000 m above sea level Climate: typical south subtropical monsoon climate Annual average precipitation: 1,950 mm Annual mean temperature: 20.8°C Relative humidity: 80% Predominant soil types: lateritic red-earth (in the lower altitude region) and yellow earth (in the higher altitude region





- **1956: Dinghushan Natural Reserve was established**
- 1978: Dinghushan Forest Ecosystem Research Station was established
- 1979: DNR became the NO.17 research station in UNESCO's MAB Network
- 1991: DHS joined in Chinese Ecosystem Research Network (CERN), CAS
- 1999: DHS joined in National Field Research Station (pilot station)
- 2002: DHS became a research station in China Fluxnet, CAS
- 2003: DHS joined in the Regional Atmospheric Observation Network, CAS.
- 2007: DHS was selected as regional core station in CERN



Core research themes are:

- Carbon, nitrogen, and water cycling in successional forests in subtropical region;
- Biodiversity and ecosystem functions





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Carbon-related monitoring and observations













Phenological monitoring

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Monitoring biomass, vegetation composition,
 soil organic matter since 1950s;

✓ Permanent plots were set in the 1970s;

✓ Regular field census carried out every 5 years.



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Carbon-related monitoring and observations

\checkmarkC and H₂O fluxes monitoring since 2002





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Nutrients-related monitoring and observations

✓ Elements (N, P, K, Ca, Na, Mg, Cu, Fe, Zn, Mn, Cr, Al...) dynamics in plant tissues, soil, and water monitoring since 1970s



Plant and soil samples









DHS Progress and achievements

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Hydrological monitoring

Regular hydrological observation since 1970s

✓ Runoff, throughfall, stem flow, soil water, etc

✓ DOC, DON, and elements





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Monitoring and Observation

Meteorological observation



Meteorological observation since 1950s

- ✓Air temperature, soil temperature
- ✓ Precipitation
- Radiation
- ✓Humidity
- ✓Evaporation

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Regional atmospheric background monitoring (since 2003)

 \checkmark O₃, CO₂, CH₄, NxO, SO₂, aerosol, etc







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Monitoring and Observation

Biodiversity monitoring





 Large sample plot for biodiversity monitoring since 2004



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✓ Long-term ecological research in DHS is financially supported by projects from Chinese Academy of Sciences, National Natural Science Foundation of China, The Ministry of Science and Technology of the People's Republic of China, Natural Science Foundation of Guangdong Province, etc.

 ✓ Over 1,000 scientific papers presented since 1970s. In recent 5 years, publications are more than 200 papers including *Science, Nature, Global Change Biology*, etc.



 ✓ Contribution of vegetation restoration to mitigate carbon emission in Guangdong regional scale.





Dinghushan Forest Ecosystem Research Station



12 staffs, 20 graduate students, 2 postdoc fellows, 4 guest professors, 8 visiting scientists

Team





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Long-term observation and monitoring with updated instruments and equipments





Layout of experimental plots in the monsoon evergreen broadleaved forest





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Canopy ecological processes



✓Biodiversity

- Physiological processes
- ✓Micrometeorology





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Decomposition experiments (1)

Effects of incubation start time on litter decomposition (since 2009)



Litterbag arrange	Start time	2009-5-28	
荷木	Sampling time		
Schima Superba	First	2009-8-28	-
	Second	2009-11-28	-
混合	Third	2010-2-28	
	Fourth	2010-5-30	
Mixed	Fifth	2010-8-30	
锥栗 Castanopsis	Sixth	2010-11+30	124
	Seventh	2011-3-3	
chinensis	Eighth	2011-6-3	



Long-term experiments

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Decomposition experiments (2)

CWD decomposition (since 2003)







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Soil respiration experiments (1)

Contribution of substrate amount on soil respiration (since 2009)





Long-term experiments

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Soil respiration experiments (2)



Partitioning soil CO2 flux (since 2009) with 7 Treatments:

No-roots;
No-litter;
No-inputs;
OA-less;
Double litter;
Mycorrhizal;
Control



Influences of precipitation variability (since 2005)



- ✓ Soil temperature, moisture regime
- ✓ Soil-atmospheric GHG exchange
- ✓Roots
- ✓Litter decomposition
- ✓ Microbial composition
- ✓SOC fraction
- ✓Understory growth
- APA (acid phosphomonoesterase activity)



Simulated acid deposition experiment (since 2008)











Simulated nitrogen deposition experiments (since 2003)



- N, C cycling ;
- Litter decomposition ;
- ✓ Soil-atmospheric GHG exchanges;
- ✓ Fine roots;
- Plant physiology;
- Microbiology;
- Carbon sequestration ability
- ✓ APA

Spatial patterns of total nitrogen deposition in 1860, early 1990s, and 2050 Source: Galloway et al., 2004



Simulated nitrogen deposition experiments (since 2003)





Long-term experiments



N, P experiments (since 2007)





Monsoon evergreen broadleaved forest





C-N interaction (OTC experiments since 2005)



Four treatments

- -High CO_2 concentration, High N deposition
- -High CO₂ concentration, Ambient N deposition
- -Ambient CO₂ concentration, High N deposition
- Ambient CO₂ concentration, Ambient N deposition





C-N-P interaction (pot experiments since 2009)

✓N:P ratio

✓Ca:Al ratio

✓ Physisological measurement









DHS station information system

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Dinghushan Forest Ecosystem Research Station Communication and cooperation



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