Line 25
McCarthy envisioned a future where users would be able to access computing resources over a network, paying for usage just like utilities. This concept did not specifically refer to cloud computing as we know it today (i.e., a scalable, on-demand infrastructure of virtualized resources). Instead, his idea revolved around time-sharing systems, where multiple users could share a single powerful computer. At that time, the term “cloud” did not exist, and computing was centralized, not distributed over many interconnected networks like the Internet today.

Line 29:
It is true that Amazon was one of the first companies to offer true cloud infrastructure services at scale with Amazon Web Services (AWS), starting with Amazon S3 in 2006 and followed by EC2. These services allowed businesses to rent storage and computing power, marking a significant shift in how cloud computing was deployed and understood. They made it easy for organizations to scale resources based on need, which contributed to the mass adoption of cloud technologies. However, they did not invent the concept of cloud computing. In the 90s, grid computing already referred to distributed computing resources to work on large tasks. Although task-specific, it is a similar concept as cloud computing. Some companies already provided Application Service Providers (ASPs), providing software applications to businesses over the Internet, an early version of delivering services remotely over a network. Additionally, Salesforce offered in 1999 an early version of the Software-as-a-Service (SaaS), model offered by Amazon. Concerning the term, it was neither new. In 1996, the term "cloud computing" was used by Compaq that described the future of computing services being provided through the web. It was also used in the telecommunications industry in the early 2000s, but it is not relevant since it referred to network infrastructure using virtual private networks (VPNs) - just a note.

In brief, the term “cloud computing” did not originate with Amazon in 2006, but Amazon was instrumental in popularizing the term and the modern concept of cloud infrastructure with AWS. The paper could be adjusted to say that Amazon popularized the modern form of cloud computing with its AWS offerings rather than claiming that Amazon coined the term or was the first to provide cloud services.

Table1

- Broad network access: Do you mean standard mechanisms such as HTTP/HTTPS or APIs? Please clarify.
- Definitions are very unbalanced and unclear. I would prefer to see some comparison of the various services such as: (just as an example)

Characteristics	Primary Focus	Client Perspective	Cloud Provider Perspective	Example
On-Demand Self-Service	Users can provision	Users can request and	Automatically provide	A developer launches a

	computing resources (e.g., storage, VMs) automatically, without requiring human interaction with the service provider	configure resources like virtual machines, storage, or applications when needed, directly from a web interface or API	resources in response to user requests without manual intervention	virtual machine on a cloud platform using a dashboard or API in minutes, without needing to contact support
Broad Network Access	Cloud resources are available over a network and accessible through standard mechanisms from various devices	Users can access cloud services from a range of devices (e.g., phones, laptops) through standard protocols like HTTP/HTTPS	Ensure cloud services can be accessed consistently and securely from different client devices	A user edits a document stored in the cloud from a laptop at home, and then continues editing from a smartphone while commuting
Resource Pooling	Cloud providers pool resources to serve multiple users (tenants) dynamically, with no fixed assignment to any one user	Users don't know the exact physical location of the resources they are using, but they get what they need as required	Dynamically allocate physical and virtual resources across many customers to maximize efficiency and utilization	Multiple customers use the same set of servers and storage, but their workloads are isolated through virtualization technologies
Rapid Elasticity	Cloud resources can be quickly scaled up or down to meet demand, often appearing limitless to the user	Users can automatically scale their resources up or down based on their needs, without delays	Automatically add or remove resources in response to changing demand, ensuring that the user has sufficient capacity	An e-commerce website automatically scales up its computing resources during a flash sale, then scales down when the traffic subsides
Measured Service	Cloud systems automatically control and optimize resource usage by tracking it and charging based on actual consumption	Users only pay for the amount of resources (e.g., storage, CPU, bandwidth) they actually use, with detailed reporting	Track resource consumption at various levels (e.g., storage, CPU usage) and optimize based on real-time monitoring	A company receives a monthly bill detailing how much computing power and storage they used, ensuring that they are

				billed accurately based on consumption

Table 3:

For Community cloud it is worth mentioning D4Science that is used for Blue Cloud which is the node of oceanography of EOSC. Not sure if the EGI and/or D4Science follow in fact hybrid models instead. It is worth confirming this.

Explanation of Table 1, 2 and 3 disconnected

I am missing the connection between the definitions of the five essential characteristics, three service models, and four deployment models. For example, how deployment models influence the service models. I believe that private Cloud more often use IaaS or PaaS, where organizations need control over sensitive data and compliance but want to maintain cloud-like services internally. Public Cloud is ideal for all service models—IaaS, PaaS, SaaS, and FaaS—as it provides high elasticity, scalability, and a broad range of services with minimal infrastructure management from users. As for private cloud, community Cloud typically uses IaaS or PaaS, where several organizations collaborate on shared resources, often due to compliance or regulatory needs. Finally, hybrid cloud: Combines IaaS, PaaS, and SaaS elements, often using public clouds for flexible, scalable services and private clouds for sensitive or mission-critical data and applications.

A table could be also added to explain how characteristics are managed in the various deployment models. Just as an example to be improved:

Characteristic	Private Cloud	Public Cloud	Community Cloud	Hybrid Cloud
On-Demand Self-Service	Managed internally, self-service for internal teams	Users provision services via public provider's API or portal	Self-service for community members, often through secure portals	Self-service across both public and private clouds, with potential for complex management
Broad Network Access	Limited to internal users or authorized external users (VPN, private network)	Accessible over the public internet via standard protocols (e.g., HTTP)	Restricted to community members with specific access	Accessible over both public and private networks, often with encrypted or dedicated connections

Resource Pooling	Resources are pooled internally for organizational needs	Resources are pooled and shared across multiple tenants	Resources are pooled among members of a specific community	Resources are pooled across private and public clouds, with dynamic allocation based on workload
Rapid Elasticity	Elasticity may be constrained by internal resources	High elasticity with near-unlimited scalability based on demand	Elasticity exists but is constrained by the community's shared resources	Public cloud provides high elasticity, with private cloud handling more stable, predictable workloads
Measured Service	Internal measurement and chargeback to departments	Public provider measures and bills based on usage (e.g., compute hours, storage)	Resource usage is tracked across community members for cost-sharing	Both private and public clouds measure usage, with different billing models (internal and public)

Line 60: The explanation emphasizes using multiple public cloud providers, but multi-cloud strategies can also include private clouds. Some organizations use a mix of private and public clouds as part of their multi-cloud setup. You may want to acknowledge that multi-cloud isn't just limited to public providers. Moreover, while the explanation focuses on the benefits, it might be useful to briefly mention some of the challenges of multi-cloud computing, such as increased complexity in management (having to manage multiple cloud environments), integration issues (ensuring compatibility between services across clouds), and security concerns (handling security policies across different providers).

Line 65: distributed cloud-edge computing also helps reduce bandwidth usage and improve data privacy by processing data locally. I believe that EGI also has some of the distributed cloud-edge aspects (to be confirmed).

Line 78: It's not the infrastructure itself that is "agile," but rather the processes (Agile and DevOps) that benefit from the scalability and automation cloud infrastructure provides.

Line 81 & 84:Instead of "Linux containers," it's more accurate to refer to them as containers or Docker containers. You could mention that Docker originally leveraged Linux-based containers, but today it supports other OS environments as well. That is one of the strong advantages of this technology.

Line 85: While HPC is a form of technical and scientific computing, a small rephrasing can help clarify this category without creating confusion. It is not the only one.

Line 94: Vance reference is from 2016. Since these technologies are evolving rapidly it would be interesting to mention a more up to date publication about this topic. Additionally, you present the advantages of cloud computing in this paragraph but it is worth to mention the down sides as well:

- Data Security and Privacy Concerns: Storing and processing large amounts of oceanographic data in the cloud raises security and privacy concerns, especially when dealing with sensitive information or data from governmental or research institutions.
- Costs for Long-Term or High-Performance Usage: While cloud computing can reduce upfront infrastructure costs, it can become expensive for continuous, long-term use or for high-performance computing (HPC) tasks that require significant computational power.
- Latency and Bandwidth Limitations: Cloud computing depends on network connections, and latency or bandwidth limitations could affect real-time processing, especially if data is being sent from remote ocean observation platforms to centralized cloud data centers.
- Dependence on Cloud Providers (Vendor Lock-In): Relying heavily on a specific cloud provider can lead to vendor lock-in, where migrating to another cloud provider becomes difficult or expensive due to proprietary technologies, APIs, or data formats.
- Regulatory and Compliance Issues: Cloud providers must comply with various regulatory frameworks, and using a public cloud for operational ocean forecasting may complicate compliance with data protection laws or environmental regulations.
- Limited Control over Hardware: Cloud users don't have direct control over the underlying hardware, which may be a disadvantage when high-performance computing (HPC) resources need fine-tuned optimization for ocean forecasting models.